



# IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

I Year, II Semester, Group A [CSE, CSE-DS, RC, AIML]

S. No.	Course Type	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BSC	MA02	Calculus	2	1	-	3
2	BSC	CH01	Applied Chemistry	3	-	-	3
3	ESC	ME02	Fundamentals of Mechanical Engineering	2	-	-	2
4	ESC	CE02	Engineering Mechanics	2	-	-	2
5	ESC	EE01	Basic Electrical Engineering	2	-	-	2
6	HSMC	HS02	Communicative English	2	-	-	2
7	BSC	CH01(P)	Applied Chemistry Lab	-	-	2	1
8	ESC	CE02(P)	Engineering Mechanics Lab	-	-	2	1
9	ESC	EE01(P)	Basic Electrical Engineering Lab	-	-	2	1
10	HSMC	HS02(P)	Language Lab	-	-	2	1
11	SBC	ME01(P)	Tech. Shop Lab	-	-	2	1
12	LLC	LLC01	Liberal Learning Course-I	-	-	2	1
<b>Total Credits</b>							<b>20</b>



# IPS Academy, Institute of Engineering & Science

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I Year, II Semester, Group B [CSIT, IOT, CSIT-CS, CE,  
EC, EX, CM, ME, FT]

S. No.	Course Type	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BSC	MA02	Calculus	2	1	-	3
2	BSC	PY01	Optics and Modern Physics	3	-	-	3
3	ESC	ME01	Engineering Graphics and Visualization	2	-	-	2
4	ESC	CE01	Basic Civil Engineering	2	-	-	2
5	ESC	EC01	Basic Electronics Engineering	2	-	-	2
6	ESC	CS01(B)	Programming for Problem Solving	2	-	-	2
7	BSC	PY01(P)	Optics and Modern Physics Lab	-	-	2	1
8	ESC	ME01(P)	Engineering Graphics Lab	-	-	2	1
9	ESC	CE01 (P)	Basic Civil Engineering Lab	-	-	2	1
10	ESC	CS01(B) (P)	Programming for Problem Solving Lab	-	-	2	1
11	SBC	EC01(P)	Electronics and Computer Workshop	-	-	2	1
12	HSMC	HS01	Design Thinking	-	-	2	1
<b>Total Credits</b>							<b>20</b>



<b>MA02</b>	<b>Calculus</b>	<b>2L:1T:0P</b>	<b>3 Credits</b>
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**Course Objective:** Mathematics is the basic necessity for the foundation of engineering and technology. The main objective of this course is to teach mathematical methods, develop mathematical skills and increase students thinking power.

**Module-1 Sequence and Series: (9 Hrs)**

Definition of sequence & series, Types of sequences (Bounded, Unbounded, Convergent, Divergent, Oscillatory, Monotonic and Cauchy's sequence), Test for convergence: Comparison test, D'Alembert's ratio test, P-series test, Raabe's test, Logarithmic test, Cauchy's root test, Leibnitz test.

**Module-2 Differential Calculus: (9 Hrs)**

Review of limits, Continuity and differentiability of univariate functions, Rolle's theorem, Mean value theorem, Taylor's series and Maclaurin's series, Expansion of function using Taylor's series and Maclaurin's series.

**Module-3 Definite Integral: (10 Hrs)**

Fundamental theorem, Properties of definite integral, Integral as limits of a sums and its application in summation of a series, Beta and Gamma function and their properties, Duplication formula.

**Module-4 Fourier Series: (9 Hrs)**

Introduction of Fourier series, Dirichlet's conditions, Parseval's identity for Fourier series, Fourier series for even and odd functions, half range Fourier series, Fourier sine and cosine series in interval.

**Module-5 Vectors: (8 Hrs)**

Inner product (Dot product), Vector product (Cross product), Limit of a vector function, Vector differentiation, Velocity and Acceleration, Gradient, Directional Derivative, Divergence, Curl, Line integral.

**Course Outcomes**

**CO 1:** Demonstrate various types of sequences and application of test of convergence to engineering problems.

**CO 2:** Recall fundamentals of differentiations and apply to engineering problems.

**CO 3:** Compute definite integrals and apply the properties of definite integral to engineering problems.

**CO 4:** Explain and apply the concept of Fourier series to engineering problems.

**CO 5:** Identify and apply the concept of vector differentiation in different engineering problems.



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## **Textbooks/References:**

1. P. Thospson, A Text Book of Higher Mathematics: Learning Calculus in a simple way.2017
2. I.A. Maron, Problems in Calculus of One Variable, Arihant Publications, 2016.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson, 14th Edition, 2018.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition,2018.
5. T.Veerarajan, Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2017.
6. B. V. Ramanna, S Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 2017.
7. R. K. Pandey, Vector Calculus, Oxford, 2012.
8. B.S. Grewal Higher Engineering Mathematics. Khanna Publishers 44<sup>th</sup> Edition.2020.
9. Shanti Narayan , Differential Calculus , S. Chand and company, New Delhi, 2013.



<b>CH01</b>	<b>Applied Chemistry</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Course Objective :** The objective of this course is to introduce the students with the concepts of Engineering Chemistry and its applications.

**Module 1: Water Analysis & its Treatment (9 Hrs.)**

Sources, Impurities, Hardness & its units, Determination of hardness by EDTA method, Alkalinity & its determination and related numerical. Boiler Problem & Softening Methods: Boiler troubles :- Sludge & scale, Priming & foaming, Boiler corrosion, Caustic embrittlement, Internal treatment methods of softening :- Calgon conditioning, Colloidal conditioning, Carbonate conditioning, Phosphate conditioning, External treatment methods of softening :- Lime-Soda method, Zeolite method and Ion exchange method and related numerical.

**Module 2: Lubricants (9 Hrs.)**

Concept of tribology, Function of lubricants, Classification of lubricants, :- Liquid, solid and semisolid lubricants, Mechanism of lubrication, Properties of lubricating oils:- Viscosity & viscosity- index and numerical, Flash & fire Point, Cloud & pour Point, Aniline point, Acid number, Saponification number, Steam emulsification number. Introduction, control & prevention of corrosion.

**Module 3: Fuel & Carbonization (9 Hrs.)**

Introduction & Classification of fuel, Calorific value; Gross calorific value and Net calorific value, Determination of calorific value by Bomb Calorimeter, Numerical by Dulong's Formula, Analysis of coal; Proximate analysis and Ultimate analysis, Introduction of carbonization, Manufacture of metallurgical coke by Otto Hoffman's byproduct oven.

**Module 4: Polymerization (9 Hrs.)**

Introduction & Classification of polymers, Mechanism of polymerization:- Free radical, Ionic polymerization, Elementary idea of biodegradable polymers. Preparation, properties and uses :- Fiber –Polyamides (Nylons 6 & 66) and Polyethylene Terephthalate (PET). Rubber/Elastomers – Natural rubber, Cis-trans rubber, Vulcanization of rubber, Synthetic Rubber : - Buna-S & Buna-N, Plastic :- (Thermoplastic & Thermosetting polymers) Phenolic resins, Urea formaldehyde resins, Silicon resins.

**Module 5 : Nanotechnology and Spectroscopic Techniques (9 Hrs.)**

Introduction of nanotechnology, growth of nano particles (Sol-gel process), An overview of various analytical techniques, Fundamentals of spectroscopy, Principle, Instrumentation and Applications of Ultraviolet–Visible spectroscopy, Infrared spectroscopy & Gas Chromatography.



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**Course Outcome:** Students will be able to:

**CO1:** Understand the principles of hardness and identify suitable softening methods.

**CO2:** To acquire knowledge about fundamentals of lubricants and their physiochemical properties.

**CO3:** Define and analyze the characteristics of coal and coke.

**CO4:** To gain the knowledge of polymers, bio-degradable polymers and engineering applications of polymers.

**CO5:** Demonstrate and apply basic concepts of nanotechnology. To impart knowledge on the essential aspects of standard analytical techniques for Spectroscopy and Chromatography.

## **Suggested Reading**

1. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing.
2. Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
3. Essentials of Physical Chemistry, Bahl & Tuli, S. Chand Publishing.
4. Applied Chemistry, Sunita Rattan, Kataria & Sons.
5. Engineering Chemistry, Baskar, Wiley India Research Gate.
6. Engineering Chemistry – I, D. Grouer Krishana, Vikas Publishing.
7. Engineering Chemistry, Jain & Jain, Dhanpat Rai & Co.
8. Chemistry of the Elements: N. N. Greenwood and A. Earnshaw, Heinemann (later Elsevier).
9. Introduction to Nanotechnology: Charles P. Poole, Frank J. Owens, Wiley India Research Gate.
10. Instrumental Methods of Chemical analysis, Willard Dean, Merritte, Tata Mac Graw Hill Ltd.
11. Laboratory Manual Engineering Chemistry, Anupma Rajput, Dhanpat Rai & Co.
12. Practical Journal of Engineering Chemistry, Dr. B. K. Mishra, Balaji learning Books.



ME02	<b>Fundamental of Mechanical Engineering</b>	2L : 0T:0P	2 Credits
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**Prerequisite (s):** 10+2 Level Physics, Chemistry

**Course Objective:** To introduce and learn various aspects of Mechanical Engineering discipline and its applications to society and to inspire students to take up Mechanical Engineering as a career.

### **Course Content:**

#### **Module 1: Material (9 Hrs)**

Classification of engineering material, Composition of Cast iron and Carbon steels. Mechanical properties like strength, hardness, toughness, ductility, brittleness, malleability, Hooks law and modulus of elasticity, Stress-strain diagram of ductile and brittle materials, Introduction to UTM.

#### **Module 2: Engines (10 Hrs)**

classification of Engine, Introduction to Gas power cycles, Carnot, Otto and Diesel Cycle with P-V and T-S Diagram, and its derivation for efficiency. Terminology used in IC Engine, Indicated, Brake power, Mechanical Efficiency. Working of two strokes, four strokes Petrol and Diesel engines.

#### **Module 3: Steam Engineering (10 Hrs)**

Classification and working of boilers, mountings and accessories, Performance and efficiency of Boiler, introduction to boiler draught. Formation of steam & its properties, T-V, H-S, T-S Diagram, use of steam table with simple numerical Problem.

#### **Module 4: Fluids and Thermal Science (12 Hrs)**

Fluid properties. Types of fluids, Newton's law of viscosity, Pascal's law, Bernoulli's equation for incompressible fluids, working principle of Hydraulic machines like turbines, Thermodynamic system, properties, state, process, Zeroth, First and Second law of thermodynamics.

#### **Module 5: Production Engineering: (9 Hrs)**

Elementary theoretical aspects of production processes like casting, carpentry, welding, Black smithy, fitting, Introduction to Lathe and Drilling machines and their various operations, welding classification and working principle.



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## Course Outcomes:

After completion of the course, the students are able to:

**CO1:** Define the Engineering Materials, Properties and applications and list the various teston materials by UTM.

**CO2:** Understand the working of internal combustion engines and their performance.

**CO3:** Evaluate and analyze performance characteristics of Boilers.

**CO4:** Identify the Fluid properties, its laws and understand the basic conceptof first and secondLaw of Thermodynamics.

**CO5:** Experiment with various manufacturing processes; carpentry, black smithy and fitting.

## Text Book/ References:

1. Basic Mechanical Engineering, by C.M. Agrawal, Basant Agrawal, Publisher: Wiley 2008.
2. Basic Mechanical Engineering by Sadhu Singh, Publisher: S Chand 2009.
3. Kothandaraman & Rudramoorthy, Fluid Mechanics & Machinery, New Age, 2007.
4. Nakra & Choudhary , Instrumentation and Measurements, TMH,2003
5. Nag P.K, Engineering Thermodynamics, TMH, 2010.
6. Ganesan , Internal Combustion Engines, TMH, 2008
7. M.I. Khan, Industrial Engineering, New Age International, 2004





CE02	Engineering Mechanics	2L:0T:0P	2 Credits
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**Course Objectives:** Students will be able to understand the basic engineering mechanics concept.

**Course Content:**

**Module 1: Introduction to Engineering Mechanics concepts (10 Hrs)**

System of Forces, Components in Space – Resultant, Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Graphical and Analytical Treatment of concurrent and non-concurrent coplanar forces, force diagrams and Bow's notations, Lami's theorem, application to simple engineering structures and components

**Module 2: Centre of Gravity and moment of Inertia (10 Hrs)**

Parallel axis and Perpendicular axis theorem, Centroid of plane figures and centre of gravity of masses and forces, moment of inertia of area and mass, radius of Gyration, principle axes of sections and principle of inertia. Symmetrical as well as unsymmetrical Section.

**Module 3: Introduction to Beams (8 Hrs)**

Beams: Types of Beams: Simply Supported Beam, Overhanging Beam, Cantilever Beam. Types of Supports of a Beam or Frame: Roller, Hinged and Fixed Supports. Different Types of Loading. Support Reaction of a Beam

**Module 4: Introduction of Trusses (10 Hrs)**

Trusses: Meaning, Types, Basic Relation between Joint, Member and Reactions (m,j,r), Analysis of Plane Trusses: Method of Joints, Method of Sections.

**Module 5: Shear Force and Bending moment (10 Hrs)**

Introductions to shear force and Bending Moment and to draw shear force and bending moment diagram for Point Load, UDL and UVL for Cantilever and Simply supported beam.

**Course Outcomes:**

Students will be able to

**CO1:** Apply concepts of forces, their resolution and applications in engineering practice.

**CO2:** Compute centroid, Centre of gravity and moment of inertia of various symmetrical and unsymmetrical sections.

**CO3:** Understand the basic concept of Beams, Supports, Loads and their Types.

**CO4:** Understand the basic concept of Plane Trusses and the methods of their analysis.

**CO5:** Introduce the concept of shear force and bending moment diagram

**Textbooks/References:**

1. Beer, Pierre, F., Johnston, E. R., Eisenberg, E. R., Mazurek, D.F., Clausen, W. E. and Cornwell, P. J..



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Vector mechanics for engineers. Vol. 4. New York: McGraw-Hill, 1977.

2. Prasad I. B., Applied Mechanics, Khanna Publication, 19<sup>th</sup> edition, 2018.
3. Prakash S. and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI, 2012.
4. Timoshenko, Stephen P., Mechanics of structure, East West press Pvt. Ltd, 1995.
5. Rajput R. K. , Engineering Mechanics, S.Chand & Co., 2013
6. Verma, M. K., Introduction to Mechanics”, Universities Press, 2016.



EE01	Basic Electrical Engineering	2L:0T:0P	2 Credits
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## Course Objectives:

To acquaint students with the basic concepts and properties of electrical circuits & magnetic circuits, along with the construction, operation & its practical applications related to single/ three-phase circuits, transformers & rotating machines and measuring instruments.

## Course Contents (Module 1 to 5):

### Module 1: DC circuits & magnetic circuits (6 Hrs.)

a) **DC Circuits:** Active & passive elements, voltage & current sources, voltage divider & current divider rules, Kirchoff's laws, star-delta transformation, energy and power in elements.

b) **Magnetic Circuits:** M.M.F., field strength, flux density, reluctance, comparison between electric and magnetic circuits, energy stored in magnetic circuits, Faradays laws of electromagnetic induction, B-H curve for magnetic & non-magnetic materials, hysteresis and eddy current losses.

### Module 2: Single & Three phase AC Circuits (6 Hrs.)

a) **Single phase AC Circuits:** Circuit analysis in sinusoidal steady state, concept of phasor, impedance, admittance, phasor diagrams, complex, real and reactive power in ac circuits, power factor and power factor correction, electricity distribution system in houses.

b) **Three phase AC Circuits:** Advantages of three phase system, phase sequence, relation between line and phase quantities for balanced star/ delta connected circuits, power measurement in three phase circuits.

### Module 3: Single Phase & Three Phase Transformers (6 Hrs.)

Construction & working principle of transformer, transformer ratings, EMF equation, equivalent circuits, phasor diagram, voltage regulation, losses & efficiency.

Elementary idea about generation of three phase power by Conventional/ Renewable energy sources. Types of transmissions/ distribution systems, Statistical data in respect of power generation & transmission voltages in India.

### Module 4: Introduction to Single/ Three Phase Machines (5 Hrs.)

Introduction to single phase machines & its applications.

Construction, principle & applications of three phase synchronous generator/ motors, three phase induction motors.

### Module 5: Measuring Instruments and Circuit Protection device (4 Hrs)

Working principle & types of Voltmeters, ammeters, wattmeter, multi-meter and energy meter, fuses and miniature circuit breakers (MCBs).



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**Course Outcomes:** Students will be able to:

**CO1:** formulate and analyses basic electric and magnetic circuits.

**CO2:** analyses single & three phase AC circuits and power factor improvement.

**CO3:** understand the basic principles of working & performance of single/ three phasetransformers.

**CO4:** understand the basic principles of working & performance of single/ three phase rotatingmachines

**CO5:** understand/ explain the types of measuring instruments for electrical quantities.

## **Textbooks/ References :**

1. Vincent Del Toro, “Electrical Engineering Fundamentals”, Prentice-Hall of India.
2. D.P. Kothari, I.J. Nagrath, “Basic Electrical Engineering”, TMH Publishing Co. Ltd., New Delhi, 3rd edition.
3. J.B. Gupta, “Basic Electrical and Electronics Engineering”, Publisher: S.K. Kataria & Sons; Edition: 6<sup>th</sup> 2011; Reprint: 2020.
4. V. N. Mittal and Arvind Mittal, “Basic Electrical Engineering” McGraw Hi
5. R. S. Muller, T.I. Kamins, “Electronics for Integrated Circuits”, 3<sup>rd</sup> edition, Wiley-India, New Delhi, 2012.



HS02	Communicative English	2L:0T:0P	2Credit
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### Course Objectives:

Make students proficient in English language to meet their futuristic professional purposes.

### Course Contents:

#### Module 1: Basics of Grammar and Vocabulary Development (8 Hrs.)

Articles, Tenses, Types of Sentences, Subject-Verb Agreement, Prefixes and Suffixes in English, Synonyms, Antonyms, One Word Substitution, Homophones, Homonyms, Analogy, Idioms, Proverbs and Phrasal Verbs, Jargon (Business, Political, Financial, Linguistic, Military, Legal, Workplace, Medical, Technical, Foreign Affairs)

#### Module 2: Fundamentals of Communication (9 Hrs.)

Definition of Communication, Process of Communication, 7C's of Communication, Types of Communication: Verbal and Non-Verbal Communication and its types, Barriers to Communication and ways to overcome it.

#### Module 3: Reading Skills (8 Hrs.)

Introduction and Benefits of Reading, Types of Reading, Techniques of Reading (SQ3R method)  
Reading Comprehension, Cloze Passages, Para Jumbled

#### Module 4: Writing Skills (10Hrs.)

Planning, Drafting and Editing, Précis writing, Structure of formal letter, Types of letters: Enquiry, Quotation, Order, Complaint, Adjustment, Resume, CV & Cover letter (Job Application)

#### Module 5: Learning Language through Literature (10Hrs.)

1. **Non-Fiction:** Atomic Habits by James Clear
2. **Literary Book:** Wise and Otherwise by Sudha Murthy
3. **Poem:** The Night of the Scorpion by Nissim Ezekiel

Student will select literature and do the assigned work under the mentorship of a teacher individually or in group.

### Course Outcomes:

**CO1:** To apply functional grammar and to enrich vocabulary of the students by learning the formation of new words through suffixes-prefixes, synonyms-antonyms.

**CO2 :** To understand and apply communication theory, practice and ready for better presentation in professional life.

**CO3 :** To help comprehend, interpret and develop reading comprehension.

**CO4 :** To identify and apply the skills, element of business letter writing and drafting in office communication.

**CO5 :** To analyze, interpret, summarize and paraphrase through selected literature (book review).



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## **Text Books**

1. Murphy's English Grammar by Raymond and Murphy: Cambridge University, New Delhi, 2008.
2. Remedial English Grammar by F.T. Wood, Macmillan, 2007.
3. Essential English Grammar by Raymond and Murphy, Cambridge University, New Delhi, 2012.
4. English for Effective Communication by Sanjay Kumar and Pushp Lata: Oxford University Press, New Delhi 2015.
5. English Language Skills by Aruna Koneru: McGraw Hills Education (India) Pvt. Ltd., New Delhi, 2015.
6. Collected Poem 1952-1988, Nizim Ezekiel, Oxford University Press, 1989
7. A Brief History of Humankind by Yuval Noah Harari HarperCollins Publishers, 2017
8. Animal Farm by George Orwell, Standard Edition, 1996

## **Reference Books**

1. Aarts, Bas (2011). Oxford Modern English Grammar, New York: Oxford University Press
2. Ajmani, J. C. Good English: Getting it Right. New Delhi: Rupa Publications, 2012.
3. Collins, Patrick. Speak with Power and Confidence. New York: Sterling, 2009.
4. Dhanavel, S.P. (2010). English and soft skills (V-1). Chennai: Orient Blackswan.
5. Fitikides, T. J. Common Mistakes in English. London: Orient Longman, 1984.
6. Rutherford, Andrea J. Basic Communication Skills for Technology: Second Edition. Delhi: Pearson Education, 2007.



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<b>CH01(P)</b>	<b>Applied Chemistry Lab</b>	<b>0L:0T:2P</b>	<b>1 credit</b>
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**List of Experiment:**

- 1) To Determine the chloride ion in a given water sample by Argentometric method.
- 2) To determine total hardness of given water sample by Complexometric titration method.
- 3) Determine the types of alkalinity in terms of  $\text{CaCO}_3$  equivalents in given water sample.
- 4) To find out the viscosity index of given lubricating oil with change in temperature by Redwood viscometer No.1.
- 5) Determination of cloud point & pour point of lubricating oil sample.
- 6) Determination of the flash & fire points of the given lubricating oil sample by Penskey Marten's Apparatus.
- 7) Determination of flash & fire points of the given lubricating oil sample by Abel's Apparatus.
- 8) Study of Ultraviolet–Visible spectrophotometer.
- 9) To determine the total dissolved solids in a given water sample.
- 10) Calculate the percentage moisture content in a given sample of coal.

**Course Outcome:** Students will be able to:

**CO1:** Determine the hardness, amount of chloride and alkalinity in water.

**CO2:** Study the properties of lubricant to compare their quality.

**CO3:** Define and analyze the important characteristics through Flash Point & Fire Point apparatus.

**CO4:** Learn advanced instrumental techniques like Ultraviolet–Visible spectroscopy.

**CO5:** Demonstrate properties of coal and its analysis.

**Textbooks/ References :**

1. Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
2. Engineering Chemistry, Baskar, Wiley India Research Gate.
3. Instrumental Methods of Chemical analysis, Willard Dean, Merritree, Tata Mac Graw Hill Ltd.
4. Laboratory Manual Engineering Chemistry, Anupma Rajput, Dhanpat Rai & Co.
5. Practical Journal of Engineering Chemistry, Dr. B. K. Mishra, Balaji learning Books.



<b>CE02(P)</b>	<b>Engineering Mechanics Lab</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
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**List of Experiment:**

1. To verify law of parallelogram of forces
2. To verify the law of triangle of forces
3. To verify the polygon law of forces
4. To verify lami's theorem
5. To verify the law of moments using bell crank lever.
6. To find the support reactions of a simply supported beam.
7. To determine moment of inertia of a given fly-wheel about its polar axis.
8. To determine the coefficient of friction of different parts of the surface on horizontal plane using different materials.
9. To determine the mechanical advantage, velocity ratio and mechanical efficiency of the simple wheel and axle.

**Course Outcomes:**

Students will be able to

- CO1.** Apply concepts of forces, their resolution and applications in engineering practice.
- CO2.** Compute centroid, Centre of gravity and moment of inertia of various symmetrical **and unsymmetrical sections.**
- CO3.** Understand the basic concept of Beams, Supports, Loads and their Types.
- CO4.** Understand the basic concept of Plane Trusses and the methods of their analysis.
- CO5.** Introduce the concept of shear force and bending moment diagram.

**Textbooks/References:**

1. Sharma, A. K. (2009), "Engineering Mechanics Practical".





<b>EE01(P)</b>	<b>Basic Electrical Engineering Lab</b>	<b>0L:0T:2P</b>	<b>1 Credits</b>
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**Course Objectives:**

To acquaint students with the basic concepts and properties of electrical circuits & magnetic circuits, along with the construction, operation & its practical applications related to single/threephase circuits, transformers & rotating machines and measuring instruments.

**List of Experiments**

1. To verify KVL and KCL.
2. To determine the value of resistance and inductance of a choke coil.
3. Measurement of 3 phase power by 1, 2 & 3 wattmeter method.
4. To study & analysis of series R-L-C circuit.
5. To study & analysis of parallel R-L-C circuit.
6. To perform the open circuit test and short circuit test of a single phase transformer.
7. To perform Load Test on single phase transformer for determining the efficiency & voltage regulation.
8. Constructional study of rotating electrical machines.
9. To obtain the turns ratio & efficiency of single phase transformer by direct loading.



# IPS Academy, Institute of Engineering & Science

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HS02(P)	Language Lab	0L:0T:2P	1 Credit
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## List of Experiment:

1. Listening Comprehension and its interpretation (Audio will be selected by the instructor)
2. Situational Conversation: Conversation through dialogue practice based on various situations.
3. Reading Comprehension: Intensive Reading Skill, Rapid Reading and Reading Aloud.

(Note: Reading material to be selected by the teacher.)

4. Speaking Skills: Oral Presentation, Extemporaneous, JAM, Group Discussion
5. Resume Writing: Preparation of Digital Resume & Video Resume

Optional: Developing Critical Thinking through Film Review or Book Review

6. Practice session through Wordsworth Software in Language Lab

## Course Outcomes:

**CO1:** To apply functional grammar and to enrich vocabulary of the students by learning the formation of new words through suffixes-prefixes, synonyms-antonyms.

**CO2:** To understand and apply communication theory, practice and ready for better presentation in professional life.

**CO3:** To help comprehend, interpret and develop reading comprehension.

**CO4 :**To identify and apply the skills, element of business letter writing and drafting in office communication.

**CO5:** To analyze, interpret, summarize and paraphrase through selected literature (book review).

## Lab Software:

1. Globarena Software, License version.



<b>ME01(P)</b>	<b>Tech. Shop Lab</b>	<b>0L : 0T : 2P</b>	<b>1 Credits</b>
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**Prerequisite(s):** NIL

### **LIST OF EXPERIMENTS**

#### **Fitting shop:**

- Preparation of work piece as per the given specifications.
- Practice marking operations.

#### **Carpentry:**

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross joint, T joint.

#### **Foundry**

- Study of tools used in foundry.

#### **Welding:**

- Study of Tools, Equipment used in welding.
- TIG Welding
- MIG Welding

#### **Machine shop:**

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine

**At the end of this course, the students should be able to:**

- Practice on manufacturing of components using workshop trades including Fitting.
- Understand the carpentry tools and practice.
- Understand the foundry shop.
- Practice the welding.
- Understand the machining operations.

#### **Text Books:**

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. Jeyapoovan T. and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub. 2008.



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<b>LLC01</b>	<b>Liberal Learning Course-I</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
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**Field work: 08 Hrs;**

**Other than field work: 16 Hrs**

**Course Objective:** To instill interest and concern among the students about the dynamics of rural society, to develop community based learning, help the students to identify and respond to community needs, Give insights of broader social issues and its impact on rural communities, inculcate value and multiple perspectives of problem solving and foster students' intellectual capabilities. Apply critical thinking skills in problem solving with social work values and ethics, on diverse human issues for rural solution engineering.

**Content:**

1. Studying the community set up in detail and developing an in-depth understanding of the field and reporting their study in the form of special report.
2. Practicing social case works with a minimum of 2 individuals; identify the problem, study, assess and develop intervention strategies for all the cases and execute the plan of intervention.
3. Working with the community by involving them on one or two issues/problems by confronting the concerned community.
4. Making a minor research study on any specific problem and submitting the report as part of field work.
5. Taking part in the programmes, seminars, workshops, etc. related to community work for the enrichment of knowledge. (With the prior permission of the Faculty supervisor).

**Methodology of Field Work**

**The following are some important modes of learning in field work:**

1. Observation
2. Informal interactions with community
3. Participatory Rural Appraisal and Participatory Learning Appraisal Methods
4. Case Discussions/Conferences
5. Sharing of experiences both among the team members and the teams
6. Additional field work if necessary

**Course Outcomes:**

**CO1:** Develop skills to understand the social, economic, political and cultural framework of the rural society.

**CO2:** Develop skills to address the challenges with suitable responses for the identified rural issues.

**CO3:** Develop skills to engage in the management of the rural community.

**CO4:** To provide the technical solution of the problems identified in the villages related to Health, Education, Agriculture, Water and Sanitation.

**CO5:** To conduct social research to evaluate the social world interventions, as well as to evaluate agency and community practice for the progress of village.



<b>PY01</b>	<b>Optics and Modern Physics</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Pre-requisites:** Mathematics course with integral and differential calculus.

**Course Objectives:** To impart knowledge in basic concepts of physics relevant to technological applications, and apply laws of physics to real world problems.

**Course Content:**

**Module 1: Quantum Physics (10 Hrs)**

ics of units and dimension, Dimensional analysis, Systems of units, Introduction to Quantum mechanics, Dual nature of matter, Compton effect, Properties of wave function, phase and group velocities, Heisenberg's uncertainty principle with its elementary proof and applications, Deriv energy and momentum operators, Time dependent and independent Schrodinger equation, Particle i one dimensional box.

**Module 2: Wave Optics (10 Hrs)**

ference of light, Young's double slit experiment, Newton's rings, Fraunhofer diffraction from single slit and N-Slit diffraction grating, Concept of Polarization, Brewster's law, Double refraction, Nicol prism, uses of Polaroid.

**Module 3: Theory of Semiconductors and Superconductors (10 Hrs)**

d theory of solids, density of states, Fermi Dirac distribution function, Fermi level in intrinsic and extrinsic semiconductor, construction and working of Zener diode and Solar Cell, Hall Effect Introduction to superconductivity, persistent currents, Meissner effect, Type-I and Type-II superconductors

**Module 4: Lasers (10 Hrs)**

erties of laser beams, Einstein's theory of matter radiation interaction and A and B coefficient explain conditions to achieve lasing action, basic parts of a laser, different types of lasers, gas laser (He-Ne and CO<sub>2</sub>), solid state laser (Ruby, Neodymium), applications of lasers.

**Module 5: Fiber Optics (10 Hrs)**

oduction to optical fibers, calculation of acceptance angle, acceptance cone, numerical aperture, V number, No. of Modes and attenuation in optical fibers, explain types of optical fibers, losses in fiber, Fiber optics communication system, applications of optical fibers.



### **Course Outcomes**

**CO1:** To explain fundamentals of units and quantum mechanics, and apply to phase velocity, group velocity, and particle in one dimensional box.

**CO2:** To analyze the intensity variation of light due to polarization, interference and diffraction, and derive intensity expression in single slit, N-slit diffraction grating. Calculate radius of curvature of lens in using Newton's ring experiment.

**CO3:** To explain theory of semiconductors and superconductors and apply to Solar cells, Zener diode, Hall Effect and Meissner effect.

**CO4:** To derive relation between Einstein's A's and B's coefficients, and explain working principle of different types of lasers.

**CO5:** To state the principle of optical fiber and calculate acceptance angle, numerical aperture, V-number, No. of modes, apply to fiber optic communication system.

### **Textbooks/ References**

1. Gaur and Gupta, Engineering Physics, Dhanpat Rai Publications.
2. H. K. Malik and A. K. Singh, Engineering Physics, Mc Graw Hill Education.
3. Dr. S. L. Gupta and Sanjeev Gupta, Engineering Physics, Dhanpat Rai Publications
4. Navneet Gupta, Engineering Physics, Dhanpat Rai Publications
5. Dr. R. Dogra, Engineering Physics, Katson Books
6. C. Kittel, Introduction to solid state physics, Wiley
7. Beiser, Concepts of Modern Physics, TMH
8. R. P. Goyal, Unified Physics, Shivrul agarwala & Co.
9. K. Thyagarajan, Ajoy Ghatak, Lasers: Fundamentals and Applications, Springer Science and Business Media.
10. O. Svelto, Principles of Lasers, Springer.



ME01	Engineering Graphics & Visualization	2L :0T:0P	2 Credits
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### Course Objective's:

- To know about Basics of Engineering Drawing.
- To know about different types of projection & to know projection of points, straight lines.
- To know about projection of plane & solids.
- To know section & development of lateral surface of different solids.
- To know about isometric projection. To learn Auto CAD

### Course Content:

#### Module 1: Introduction

(10Hrs)

Need & Classification of Engineering Drawings

**Scales:** Engineering scale- plain scale, diagonal scale, comparative scale, scale of chord. **Engineering**

**Curves:** Conic sections-ellipse, parabola and hyperbola. Special curve-Cycloid, Involute and spirals

#### Module 2: Orthographic Projections

(8 Hrs)

Drawing orthographic projections from pictorial projections by using first angle projection method.

**Projection of Point:** Including points in all four quadrants.

**Projection of Lines:** Line parallel to reference plane, perpendicular to reference plane, inclined to one reference plane, inclined to both reference planes, traces of line.

#### Module 3: Projection of Plane Surfaces

(12 Hrs)

Projections of planes parallel to one of the reference planes, Projections of planes inclined to one reference plane and perpendicular to the other & Projections of oblique planes.

**Projection of Solids:** Classification of solid, projections of solids in simple and complex positions of the axis.

#### Module 4: Section of Solids

(10 Hrs)

Sectional views and true shape of the section.

**Development of Surfaces:** Methods of developments, development of various solids.

**Interpenetration of Solids:** Interpenetration of geometrical solids (two cylinders).

#### Module 5: Isometric Projections

(8 Hrs)

Isometric view, Isometric scale to draw Isometric projection, construction of isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, Cylinder & Prism.

**Auto CAD:** Introduction to Computer Aided Drawings its application & advantages. Command used in Auto CAD.



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## Course Outcomes:

After completion of this course, the student will be able to:

1. Read and write the language of Engineering Graphics to study its basic theory.
2. Prepare neat orthographic drawings of points, straight lines, and regular planes and solids.
3. Prepare neat drawings of projection of regular planes and solids.
4. Understand application of section, development and penetration of solids.
5. To be able to plan and prepare neat isometric drawings of regular planes and solids and hands on practice on Auto CAD.

## List of Text Book:

1. Bhatt N D, Engineering Drawing, Charoter Publishing House, Anand, Gujrat ,53rd Edition. 2014
2. Agrawal B, and Agrawal C M, Engineering Drawing, Tata McGraw-Hill Publishing Company Limited. 3rd Edition, 2019
3. Dhawan R.K. Engineering Drawing, S. Chand Publication.2012

## List of References Book:

1. French T E, Vierck C J, Foster R J, Engineering. Drawing and Graphic Technology Mc Graw-Hill International, Singapore, 4th Ed., McGraw Hill, 1984
2. Luzadder W J, Duff J M, Fundamentals of Engineering Drawing, Prentice- Hall India, New Delhi. Eleventh Edition, 1983.
3. Dhananjay A Jolhe, Engineering drawing, Tata McGraw Hill. 2017
4. Shah M B and Rana B C , Engineering Drawing, Pearson Education, New Delhi. 2nd Edition, 2019





<b>CE01</b>	<b>Basic Civil Engineering</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
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**Course Objectives:** Students will be able to understand the basic properties of construction materials and key concept of surveying. Course Content:

**Module 1: Overview of Civil Engineering (10 Hrs)**

Types of infrastructures, Effect of infrastructure facilities on economy and environment, Role of Civil Engineers in the infrastructural Development Introduction to sub-domains of Civil Engineering.

**Module 2: Introduction to construction materials & techniques (10Hrs)**

Properties and classification, of common building materials – Stones, Bricks, Sand, Limes, Cement, Mortar, Concrete, Steel.

**Module 3: Elements of Building Construction (10Hrs)**

Beam, Column, Slab, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability.

**Module 4: Basic Concepts of surveying (10Hrs)**

Linear measurements: Chain and Tape Surveying, Errors, Obstacles, Booking and Plotting, Calculation of Areas.

Angular Measurements: Bearing, Prismatic Compass, Local Attraction, traverse open and closed, plotting of traverse, accuracy and precision.

**Module 5: Levelling (10 Hrs)**

Introduction, definitions, Levelling instruments, classification of levelling, Booking and Reducing Levels & Methods.

**Course Outcomes (Cos)**

CO1 To understand the basic concept of infrastructure and its development in civil engineering

CO2 To gather the basic knowledge of building materials.

CO3 To understand the building components used in civil engineering.

CO4 To develop the knowledge of land survey with the help of traditional and modern techniques and instrument.

CO5 To analysis the basic concept of leveling and its methods.





**References/ Books/ Codes**

1. Ramamrutham, S., and R. Narayan. *Strength of materials*. Dhanpat Rai Pub Company, 2008..
2. Shesha Prakash and Mogaveer; *Elements of Civil Engg & Engg. Mechanics*; PHI, 2012
3. Duggal, S. K. *Surveying*. Vol. 1. Tata McGraw-Hill Education, 2013..
4. Rangwala S. C. *Building Construction* Charotar publications House, Anand, 2010
5. Singh, Gurcharan. *Building Construction and Materials*. Rajsons Publications Pvt. Ltd., 2019.
6. Standard I.(875).(Part 1). "Code of practice for design loads for buildings and structures." (1987).



EC01	Basic Electronics Engineering	2L:0T:0P	2 Credits
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**Course Objective:** This course provides the student with the fundamental skills to understand the basic of electronics components like logic gates, and electronic measurement devices etc. It will build mathematical and numerical background for design of electronic circuits. Students equipped with the knowledge and training provided in the course will be able to participate in design, development and operation in the different area of electronics system.

### **Module 1: Number Systems (4 Hrs)**

Decimal Number System, Binary Number System, Converting Decimal to Binary, Hexadecimal Number System: Converting Binary to Hexadecimal, Hexadecimal to Binary, Converting Hexadecimal to Decimal, Converting Decimal to Hexadecimal, Octal Numbers: Binary to Octal Conversion. Complement of Binary Numbers.

### **Module 2: Boolean Algebra & Logic Gates (6 Hrs)**

Boolean algebra, Logic gates, NOT Gate, AND Gate, OR Gate, XOR Gate, NAND Gate, NOR Gate, X-NOR Gate. NAND and NOR Implementation. De Morgan's theorem, Minimization using K-Map.

### **Module 3: Selection, Specification & Types of Electronics Equipments (4Hrs.)**

Mobile, RAM, ROM, Battery, UPS, Various Chargers, PC & Laptop, E-Vehicles, Printer, Router, Hub, Switch, Keyboard, LED, LCD Monitors, Screen types, Smart Watches, Pacemakers, B.P. Machines, Pulse meter, Temperature guns, Walkie Talkie.

### **Module 4: Communication Systems (6 Hrs)**

Introduction, Elements of Communication Systems, Modulation: Amplitude Modulation, Spectrum Power, AM Detection (Demodulation), Frequency and Phase Modulation, Amplitude and Frequency Modulation: A comparison, Introduction to Digital Communication.

### **Module 5: Transducers (4 Hrs)**

Half wave & Full wave Rectifier, Zener diode, Introduction to Transducers, Working of Transducers, their specifications, types and its applications.



**Course Outcomes:**

Students earning credits will develop ability to:

CO1. Appreciate the significance of electronics in different applications and understand the applications of number system.

CO2. Compile the different building blocks in digital electronics using logic gates and implement simple logic function using basic universal gates.

CO3. Understand the functioning of different types of Electronics Equipments.

CO4. Understand the functioning of a communication system and different modulation technologies.

CO5. Understand the basic principle and application of different types of Transducers.

**Textbooks/References:**

1. Leach, Malvino, "Digital Principles and Applications (SIE)", 8<sup>th</sup> edition, McGraw Hill Education, 2014
2. Singh & Sapre, "Communication Systems", 2<sup>nd</sup> edition, TMH, 2008.
3. B. P. Lathi, "Modern Analog and Digital Communication Systems", 3<sup>rd</sup> edition, Oxford University Press, 2007.
4. H.S. Kalsi, "Electronics Instrumentation", 2<sup>nd</sup> edition, TMH, 2004.
5. Millman & Halkias, "Electronic Devices and Circuits", 4<sup>th</sup> edition, TMH, 2015.



<b>CS01(B)</b>	<b>Programming for Problem Solving</b>	<b>3L: 0T: 2P (5 hrs.)</b>	<b>4 credits</b>
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### **Module 1: Introduction**

**(11Hrs.)**

Introduction to Computer system: History, Evolution, Generation. Hardware, Software, Input-Output Devices and Memory. Introduction to Operating System, Introduction to Computer Network, Introduction to Internet.

### **Module 2: Programming**

**(11Hrs.)**

Introduction to Programming: Computer languages, creating and running programs, Algorithms, flowcharts. Introduction to C language: History of C, basic structure of C programs, C tokens, keywords, identifiers, constants, strings, special symbols, variables, data types, I/O statements.

### **Module 3: Operators, Expressions and Control Structures**

**(11Hrs.)**

Operators and expressions: operator precedence and associativity, evaluation of expressions, type conversions in expressions. Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops.

### **Module 4: Arrays and Functions**

**(11Hrs.)**

Arrays: Concepts, One dimensional array, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi dimensional arrays.

Functions: User defined and built-in Functions, storage classes, Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference, Recursion.

### **Module 5: Strings and Pointers**

**(11Hrs.)**

Strings: Arrays of characters, variable length character strings, inputting character strings, character library functions, string handling functions. Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, functions returning pointers, Dynamic memory allocation.

### **Course Outcome:**

1. Explain Introduction to Computer system.
2. Recognize programming concepts.
3. Use Operators, Expressions and Control Structures.
4. To Decompose a problem into functions and Using Array.
5. Use Strings and Pointers to write C programs.

### **Textbooks / References:**

1. Kerninghan & Ritchie "The C programming language" 2nd Ed., PHI,
2. Schildt "C: The Complete reference" 4th Ed. TMH.
3. Kanetkar Y. "Let us C", BPB Publications, 2004
4. Kanetkar Y.: "Pointers in C" , BPB Publications, 2007
5. Stephen Parata "C Primer Plus" 5th Ed., Sams, 2004



<b>PY01(P)</b>	<b>Optics and Modern Physics Lab</b>	<b>0L:0T:2P</b>	<b>1 Credits</b>
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## List of Experiment

1. Determine wavelength of given laser light source.
2. Determine the radius of curvature of given plano convex lens with the help of a Newton's ring experiment.
3. Determine the wavelength of main spectral lines of given mercury light with help of a diffraction grating.
4. Determine refractive index and dispersive power of the material of given prism using spectrometer.
5. Plot forward and reverse characteristics curve of P-N junction diode.
6. Determine the divergence of He-Ne Laser.
7. Find numerical aperture of a given optic fibre and hence to find its acceptance angle.
8. Verify Brewster's law using polarizer.
9. Determine the Hall voltage and charge carrier density, in semiconductor using Hall effect experiment.
10. Plot forward and reverse characteristics curve of Zener diode.

## Course Outcomes

**CO1:** To explain fundamentals of units and quantum mechanics, and apply to phase velocity, group velocity, and particle in one dimensional box.

**CO2:** To analyze the intensity variation of light due to polarization, interference and diffraction, and derive intensity expression in single slit, N-slit diffraction grating. Calculate radius of curvature of lens in using Newton's ring experiment.

**CO3:** To explain theory of semiconductors and superconductors and apply to Solar cells, Zener diode, Hall Effect and Meissner effect.

**CO4:** To derive relation between Einstein's A's and B's coefficients, and explain working principle of different types of lasers.

**CO5:** To state the principle of optical fiber and calculate acceptance angle, numerical aperture, V-number, No. of modes, apply to fiber optic communication system.



<b>ME01(P)</b>	<b>Engineering Graphics Lab</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
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**List of Practical:**

Students must prepare sketch book and drawing sheets on the following topics.

1. Plane scale and diagonal scale
2. Engineering curves
3. Projection of line
4. Projection of plane
5. Projection of solid
6. Section of solid
7. Development of surfaces
8. Intersection of solids.
9. Orthographic projection
10. Isometric projection

**Course Outcomes:**

After completion of this course, the student will be able to:

CO1. Prepare neat drawings of scale & Curve and understand the use of scale.

CO2. Understand application of orthographic drawings and prepare drawing of points, straight lines.

CO3. Prepare neat drawings of projection of regular planes and solids.

CO4. Understand application of section, development and penetration of solids.

CO5. Prepare neat isometric drawings of regular planes and solids and hands on practice on Auto CAD.



<b>CE01(P)</b>	<b>Basic Civil Engineering Lab</b>	<b>0L:0T:2P</b>	<b>1Credit</b>
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**List of Experiment:**

1. To determine the Accuracy of Dimensions of Bricks.
2. To determine the Compressive Strength of Bricks.
3. To determine the Consistency of Cement Sample.
4. To perform chain survey and located offsets.
5. To determine bearings of lines of given quadrilateral.

**Cours Outcomes (Cos)**

CO1 To understand the basic concept and qualities of building materials.

CO2 To gather the basic knowledge of building materials.

CO3 To understand the building test used in civil engineering.

CO4 To develop the knowledge of land survey with the help of traditional and modern techniques and instrument.

CO5 To analysis the basic concept of leveling and its methods through various instruments.

**References/Books/Codes**

1. Rangwala S. C. Building Construction Charotar publications House, Anand, 2010





CS01(B)(P)	<b>Programming for Problem Solving Lab</b>	<b>0L : 0T : 2P</b>	<b>1 Credit</b>
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**List of Experiments:**

**Write a C program:**

1. To display "Hello Computer" on the screen.
2. To display Your Name, Address and City in different lines.
3. To find the area and volume of sphere. Formulas are: Area =  $4*PI*R*R$  Volume =  $4/3*PI*R*R*R$ .
4. To convert centigrade into Fahrenheit. Formula:  $C = (F-32)/1.8$ .
5. To swap variable values of i and j.
6. To find the maximum from given three nos.
7. For calculator designing using switch /case loop?
8. To find the sum of first 100 natural nos.
9. To display first 100 prime numbers.
10. To find factorial of accepted numbers.
11. To find minimum, maximum, sum and average of the given one dimensional array.

**Course Outcome:**

1. Use basic computer concepts to write a C program.
2. Recognize programming concepts.
3. Use Operators, Expressions and Control Structures.
4. To Decompose a problem into functions and Using Array.
5. Use Strings and Pointers to write C programs.

**Textbooks / References:**

1. Kerninghan & Ritchie "The C programming language" 2nd Ed., PHI,



<b>EC01(P)</b>	<b>Electronics and Computer Workshop</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
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**Course Objective:** The course objectives are to identify different electronic components, devices, making circuit on bread board and PCB using simple ICs and components and testing, to assemble Desktop and creating a LAN network for PCs.

## **(PartA) Electronics**

### **Module 1: (4 Hrs.)**

Identification of various electrical passive components such as R, C, L, transformers, relays, switches, bread board, universal printed circuit board. Series and parallel connection of the resistances and its implementation on breadboard. General Electrical wiring & Specifications, Phase, Neutral, earthing, ground, wire color code, 2 Plug/3plug pin connection, switches, socket, MCB, regulator connection, 2 way switch connections, serial and parallel connections, precautions related to electrical equipments.

### **Module 2: (4 Hrs.)**

Exposure to usual electronic equipment/instruments such as Multi-meter, digital clamp meter, Oscilloscope; CRO, DSO, Function generator, IC tester and Power supply, Information about their front panels, Demonstrations on their working, Hands-on for measurement of component values and DC voltage using multi- meter.

### **Module 3: (4 Hrs.)**

Circuit building practice on standard breadboard using digital ICs like Op-amp (IC 741), IC555 etc., acquaintance with ratings, specifications using data-sheets. Electronic circuit design in a team of 3-4 students, designing of single sided PCB, PCB fabrication process, component mounting and soldering.

## **(Part B) Computer**

### **Module 1: (4 Hrs.)**

Name and identify various PC hardware components: USB Mouse, PS/2 Mouse, Keyboard, LCD/LED Monitor, VGA, HDMI, CAT5, CAT6, fiber cable, Hard disk (HDD, SSD), RAM, CMOS battery, Laptop/Mobile Battery, SMPS, cache, ROM, BIOS

### **Module 2: (4 Hrs.)**

Introduction to various important software: Windows, Ubuntu, Microsoft Office; Firefox, Google Chrome, Edge; Understand the broad structure and functioning of the Internet; General introduction to Website and web server, malware, virus. Understand basic networking commands, applications and services: SSH, TELNET, FTP, ping, http, https, and various search services (google, startpage, aggregator search services).



## Module 3:

(4 Hrs.)

Assemble a Desktop PC from its components, Installation of Windows, display settings,

Introduction to: LAN, DNS, Proxy, Router, Hub, Switch, Server, Client, LAN Network creation, enabling and disabling of firewall. General Specification of electronics equipments.

## Module 4:

(4 Hrs.)

Information and Communications Technology (ICT): Online Teaching and Learning platform; MS team, Google Meet, Zoom, Webex their applications, Video from ppt, MOOC platform: NPTEL, EDX, Coursera, Swayam, etc.

### Example of projects:

- Designing of power supply for 9/5 V.
- IC 555 based timer and square wave generator
- OP-amp IC 741 based analog computer(adder/subtractor/integrator/differentiator)
- PC Assembling and disassembling.
- Installation of operating system.
- Establishment of LAN.

### Course Outcomes:

Students earning credits will develop ability to:

CO1. Identify various electronic components and use of electronic devices and instruments.

CO2. Design and test simple electronic circuit on PCB.

CO3. Know hardware components of computer systems, various software and hardware terms and their uses.

CO4. Learn the setup of a working desktop and creating a LAN network for PCs.

CO5. Learn about ICT enable tools for Teaching and Learning.



**Textbooks/References:**

1. S. Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits: second edition, Tata McGraw Hills, 2011.
2. Behrouz A. Forouzan, data Communications and Networking (SIE) | 4th Edition, McGraw Hill Education.
3. [www.mooc.org](http://www.mooc.org).
4. [https://en.wikipedia.org/wiki/List\\_of\\_MOOC\\_providers](https://en.wikipedia.org/wiki/List_of_MOOC_providers).
5. <https://teambuilding.com/blog/virtual-meeting-platforms>.



<b>HS01</b>	<b>Design Thinking</b>	<b>0L:0T:02P</b>	<b>1 Credit</b>
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**Course Objectives:** The objectives of this course are to

1. To impart knowledge on design thinking process for understanding complex designs.
2. To analyze design thinking issues and apply the tools and techniques of design.
3. To inculcate attitude to solve societal problems using design thinking tools.

### **Module 1 : Introduction to Design Thinking**

Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking.

### **Module 2: Design Thinking Methodology**

The 5 Stages of the Design Thinking Process- Empathise, Define (the problem), Ideate, Prototype, and Test.

### **Module 3: Ideation & Empathize**

Ideation tools & exercises, Sample Design Challenge, Introduction to the Design Challenge Themes Empathize-Understand customers, Empathy Maps, Empathise-Step into customers shoes Customer Journey Maps.

### **Module 4: Prototyping**

What is a prototype, Prototyping as a mindset, prototype examples, prototyping for products;

### **Module 5: Testing Prototypes**

Prototyping for digital products: What's unique for digital products, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users.

**Course Outcomes:** After completion of the course the student will be able to

- CO1. Analyze design thinking concepts and principles.
- CO2. Understand design thinking methodology.
- CO3. Create empathy maps to visualize user attitudes and behavior for gaining insights of customers.
- CO4. Build prototypes for complex problems using gathered user requirements.
- CO5. Test prototypes for complex problems and gathered information.



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## **Text Books:**

1. S.Salivahanan, S.Suresh Kumar, D.Praveen Sam, “Introduction to Design Thinking”,Tata Mc Graw Hill, First Edition,2019.
2. Kathryn McElroy, “Prototyping for Designers: Developing the best Digital and Physical Products”, O’Reilly, 2017.

## **Reference Books:**

1. Michael G. Luchs, Scott Swan , Abbie Griffin,”Design Thinking – New Product Essentials from PDMA”, Wiley, 2015.
2. Vijay Kumar, “101 Design Methods: A Structured Approach for Driving Innovation in Your Organization”, 2012.