Kurukshetra University, Kurukshetra

(Established by the State Legislature Act XII of 1956)
('A++' Grade, NAAC Accredited)

।। योगस्थः कुरु कर्माणि।।
समबुद्धि व योग युक्त होकर कर्म करो

(Perform Actions while Stead fasting in the State of Yoga)

DEPARTMENT OF INSTRUMENTATION (DOI)

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering
(For the Batches Admitted from 2024-2025)

OUTCOME BASED EDUCATION SYSTEM

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering
(For the Batches Admitted from 2024-2025)

VISION
Be globally acknowledged as a distinguished centre of academic excellence.

MISSION
To prepare a class of proficient scholars and professionals with ingrained human values and commitment to expand the frontiers of knowledge for the advancement of society.

DEPARTMENT VISION AND MISSION:

VISION
- To become a model department as a Centre of quality education, research with innovation and recognition at National and International level for serving society.

MISSION
- **M1:** To provide quality education to aspiring young minds for improving their skills, inculcating values, creating leadership qualities and enhance research with innovative methods.
- **M2:** To produce young engineers capable to be utilized in the areas of New Technological Design, Environment, ethics and sustainable technologies.
- **M3:** To develop Teaching-Learning methods which can produce socially committed good professional human being who can contribute effectively in Nation building and represent Country Internationally.

Mapping of University Vision and Mission to Department Vision and Mission
Acclaimed as modal Centre of Learning and Research by

University Vision and Mission	**Department Vision and Mission**
High quality knowledge delivery through state of art infrastructure and ethical values to the students	**Yes**
Students excellence will make them professionals and innovators emerging as global leaders	**Yes**
Research and development will help in furtherance of Faculty knowledge	**Yes**

Programme Educational Objectives (PEOs):
The Department of Instrumentation in consultation with various stakeholders have formulated the Programme Educational Objectives (PEO's) that are broad statements that describe the career and professional accomplishments that the program is preparing its graduates to achieve in few years,

subsequent to receiving the degree. The PEO's of the B. Tech. programme in Electrical Engineering are as follows:

- **PEO1:**The graduates will become competent by applying their technical and managerial skills.
- **PEO2:**The graduates will be able to adapt to any environment and succeed in higher positions in contemporary rapidly evolving technologies in Electrical engineering field.
- **PEO3:**The graduates will engage themselves in the life-long learning by pursuing higher education and participation in research and development activities to meet all challenges to transform them as responsible citizens of the nation

Program Specific Outcomes (PSO's):

- **PSO1:** Clearly understand the fundamental concepts of Electrical Engineering
- **PSO2:** Graduates will be able to formulate and solve real life problems in the area of Electrical Engineering
- **PSO3:** Graduate will possess the skills to communicate effectively in both oral and written forms, demonstrating the practice of professional ethics, and responsive to societal and environmental needs.

PEOs to Mission statement mapping

PEO's	MISSION OF THE DEPARTMENT		
	M1	M2	M3
PEO1	3	3	1
PEO2	2	3	2
PEO3	2	2	3

Program Outcomes (PO) with Graduate Attributes

Programme Outcomes are attributes of the graduates from the programme that are indicative of the graduates' ability and competence to work as an engineering professional upon graduation. Program Outcomes are statements that describe what students are expected to know or do by the time of graduation, they must relate to knowledge and skills that the students acquire from the programme. The achievement of all outcomes indicates that the student is well prepared to achieve the program educational objectives down the road. The Department of Instrumentation has following twelve PO's. The course syllabi and the overall curriculum are designed to achieve these outcomes:

S. No	Graduate Attributes	Program Outcomes (POs)
1	Engineering Knowledge	**PO1:** Able to understand the fundamentals of mathematics, science, Electrical Engineering and apply them to provide solution of complex engineering problems.
2	Problem Analysis	**PO2:** Ability to analyze, identify, formulate and solve engineering problems in Electrical Engineering using basic fundamental principles of mathematics and science.
3	Design and Development of Solutions	**PO3:** Design a system, component or process to meet the desired needs and standards within realistic constraints such as public health and safety, social and environmental considerations.
4	Investigation of Problem	**PO4:** Design and conduct experiments, as well as do research, analyze and interpret data and give clear solutions.
5	Modern Tool usage	**PO5:** Use and learn the recent techniques, skills and modern engineering and IT tools necessary for engineering practicewith an understanding of the limitations.
6	Engineer and society	**PO6**: To give basic knowledge of social, economic, safety and cultural issues relevant to professional engineering.

7	Environment and sustainability	**PO7:** To impart knowledge related to the design and development of modern systems which are environmentally sensitive and to understand the importance of sustainable development.
8	Ethics	**PO8:** Apply ethical principles and professional responsibilities in engineering practice.
9	Individual & team work	**PO9:** Ability to visualize and function as an individual and as a member in a team of a multi-disciplinary environment.
10	Communication	**PO10:** Ability to communicate effectively on complex engineering ideas to the engineering community & the society at large. (i.e. being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions)
11	Lifelong learning	**PO11:** To impart education to learn and to engage in independent and life – long learning in the technological change.
12	Project management and finance	**PO12:** Ability to handle administrative responsibilities, manage projects & handle finance related issues in a multidisciplinary environment.

Mapping of PEO's with PO's

S. No.	*Program Educational Objectives*	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	The graduates will become competent by applying their technical and managerial skills.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2	The graduates will be able to adapt to any environment and succeed in higher positions in contemporary rapidly evolving technologies in Electrical engineering field.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3	The graduates will engage themselves in the life-long learning by pursuing higher education and participation in research and development activities to meet all challenges to transform them as responsible citizens of the nation			√	√		√	√	√	√		√	√	√	√	√

Kurukshetra University Kurukshetra

CBCS CURRICULUM (2024 -25)

Under Graduate Degree Program Name: B. Tech. (Electrical Engineering)

Definition of Credit:

1 Hour Lecture (L) per week	1 credit
1 Hour Tutorial (T) per week	1 credit
1 Hour Practical (P) per week and/or 2 Hours Practical(Lab)/week	0.5 credits 1 credit

Course code and definition:

Category of Course/ Code	Definitions
L	Lecture
T	Tutorial
P	Practical
C	Credit
CIE	Continuous Internal Evaluation
SEE	Semester End Examination
BS	Basic Science Courses
ES	Engineering Science Courses
HSM	Humanities, Social Sciences and Management Courses
EE	Electrical Engineering
PC	Professional core courses
PE	Professional Elective courses
OE	Open Elective courses
PRBS/ PRPC/ PRES/PRPE/ PROE/ PRHSM	Practical Basic Science/Professional Core/ Engineering Science/ Program Elective/ Open Elective/Humanities, Social Sciences and Management Courses
MC	Mandatory courses
PROJ	Project

B. Tech (Electrical Engineering), SCHEME OF EXAMINATIONS
1st YEAR (SEMESTER–I) (w.e.f.2024-25)

Course No.	Course Title	C	Teaching Schedule				Allotment of marks			Exam Duration in Hrs.
			L	T	P	Cont. Hrs.	CIE	SEE	Total	
EE-ES-101	Basic Electrical Engineering	4	3	1	-	4	40	60	100	3 Hrs
EE-BS-103	Introduction to Electromagnetic Theory	4	3	1	-	4	40	60	100	3 Hrs
EE-BS-105	Engineering Chemistry	4	3	1	-	4	40	60	100	3 Hrs
EE-HSM-107	English for Technical Writing	2	2	-	-	2	40	60	100	3 Hrs
EE-BS-109	Mathematics-I	4	3	1	-	4	40	60	100	3 Hrs
EE-PRES-01	Basic Electrical Engineering Lab	1	-	-	2	2	20	30	50	3 Hrs
EE-PRBS-03	Electromagnetics Lab	1	-	-	2	2	20	30	50	3 Hrs
EE-PRBS-05	Engineering Chemistry Lab	1	-	-	2	2	20	30	50	3 Hrs
EE-PRHSM-07	English Language Lab	1	-	-	2	2	50	--	50	--
	Total	**22**	**14**	**4**	**8**	**26**	**310**	**390**	**700**	

B. Tech (Electrical Engineering), SCHEME OF EXAMINATIONS
1stYEAR (SEMESTER–II) (w.e.f.2024-25)

Course No.	Course Title	C	Teaching Schedule				Allotment of marks			Exam Duration in Hrs.
			L	T	P	Cont. Hrs.	CIE	SEE	Total	
EE-BS-102	Semiconductor Physics	4	3	1	-	4	40	60	100	3 Hrs
EE-ES-104	Programming for Problem Solving	4	3	1	-	4	40	60	100	3 Hrs
EE-ES-106	Engineering Graphics and Design	2	2	-	-	2	40	60	100	3Hr
EE-HSM-108	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	3	3	0	-	3	40	60	100	3 Hrs
EE-BS-110	Mathematics-II	4	3	1	-	4	40	60	100	3 Hrs
EE-PRES-02	Semiconductor Physics Lab	1	-	-	2	2	20	30	50	3 Hrs
EE-PRES-04	Programming for Problem Solving Lab	1	-	-	2	2	20	30	75	3 Hrs
EE-PRES-06	Engineering Graphics and Design lab	1	-	-	2	2	20	30	50	3 Hrs
EE-PRES-08	Manufacturing Processes Workshop	1	-	-	2	2	20	30	50	3 Hrs
EE-PRES-10	Idea Workshop	1	-	-	2	2	20	30	50	3Hrs
	Total	**22**	**14**	**3**	**10**	**27**	**300**	**450**	**750**	

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-ES-101	**Course Name:** Basic Electrical Engineering	**L**	**T**	**P**	**C**
		3	**1**	**-**	**4**
Year and Semester	**1st year** **1st Semester**	**Contact hours per week:** (4Hrs) **Exam:** (3hrs.)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 40	**SEE: 60**		

Course Objectives:

1. To study basics theory, laws and theorem of DC electrical networks.
2. To study working of various electrical AC circuits, magnetic circuits and its parameters.
3. To study the working theory of AC and DC electrical machines.
4. To introduce the domestic wiring and earthing in electrical system.

Course Outcomes: On completion of the course, student would be able to:

CO1	To understand the basic concept of electrical circuits, electrical laws and network theorems.
CO2	To understand the basic components and working theory of DC and AC network.
CO3	To understand the parameters of electrical networks and equipment.
CO4	To understand the circuits and working of various electrical machines.
CO5	To impart basic technical knowledge of electrical wiring system and apply it to technological fields.

Module No	**COURSE SYLLABUS CONTENTS OF MODULE**	**Hrs**	**COs**
1	**DC Circuits:** Electrical circuit elements (Resistance, inductance and Capacitance), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.	**7**	**CO1, CO2**
2	**AC Circuits:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, power factor improvement and its significance. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.3-phase power equation, measurement of three phase power by two wattmeter method.	**7**	**CO1, CO2, CO3**
3	**Transformers:** Magnetic materials, BH characteristics, working of ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections**.**	**7**	**CO3, CO4**
4	**Electrical Rotating Machines:** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Construction and working of Single-phase induction motor and torque-speed characteristic. Construction and working of DC machine and speed control of separately dc motor. Construction and working of synchronous generators.	**8**	**CO3, CO4**
5	**Electrical Installations:** Components of domestic wiring system,	**4**	**CO3,**

	earthing system and its significance. Elementary calculations for energy consumption.		**CO5**

Suggested Text / Reference Books:

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India,1989.
6. B.L. Theraja and A. K. Theraja, “Electrical Technology”,Vol-I, S.Chand.

Note for Examiner(s): Question paper will comprise three sections,

1. Section-A will be compulsory and comprise 4-short answer type questions uniformly spread to the entire syllabus.

2. Section-B will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on concepts, definitions, derivations, principles, construction and working etc.

3. Section-C will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on derivations, numerical and applications of the various topics covered therein.

Note for Students:

1. Section – A is compulsory and attempt/answer all the four questions carrying 12 marks in total.

2. Attempt/answer two questions each out of the Section – B and Section – C. All questions will carry 12 marks.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-BS-103	**Course Name:** Introduction to Electromagnetic Theory	**L**	**T**	**P**	**C**
		3	**1**	**-**	**4**
Year and Semester	**1st Yr.** **1st Semester**	**Contact hours per week:** (4Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 40	**SEE: 60**		

Course Objectives:

1. It aims to equip the students with basic concepts of physics principles.
2. To provide adequate knowledge about tools at an intermediate to advanced level.
3. To provide students to serve them well towards tackling more advanced level of physical problems.
4. To provide knowledge and applications that they would find useful in their core subjects
5. To provide knowledge about different applications of optics, EM-theory,

Course Outcomes: On completion of the course, student would be able to:

CO1	Understand the applications of Electricity and Magnetism
CO2	Understand components of a EM-Wave propagation
CO3	Understand Electro and magneto statics, Maxwell's equations
CO4	Learn about potential applications of dielectric and Magnetic materials
CO5	Understand the material composition and its applications

Module No	**COURSE SYLLABUS CONTENTS OF MODULE**	**Hrs**	**Cos**
1	Differential and integral calculus: Concept of gradient, operator, divergence and curl Line, surface and volume integrals, **Electrostatics:** Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential, Electrostatic field and charge density. electrostatics problems in presence of dielectrics.	**8**	**CO4 CO1**
2	**Magnetostatics** Gauss –Divergence theorem, Stokes theorem, Equation of continuity, Divergence of magnetic induction, Biot savarts law. Magnetic vector potential, Amperes circuital law, Faraday's law of electromagnetic induction,	**8**	**CO1**
3	**EM – Theory:** The basic equations of electromagnetism, generalization of amperes law, Maxwell's equations. Energy in an electromagnetic field; Flow of energy and Poynting vector with examples. Hall Effect.	**9**	**CO2 CO3**
4	**Dielectric and Magnetic materials:** Introduction, Nonpolar molecules, Polar molecules, Polar and nonpolar molecules in an electric field, Electric polarization of matter, Electric polarization vector, Electric field in dielectrics, Gauss's law in dielectrics, Relation between three electric vectors D, E and P, Effect of dielectric on capacitance. Magnetization of matter (Origin of Magnetic Moment, Diamagnetism, Paramagnetism, Ferromagnetism, B, H, M), Anti-ferro magnetism. Ferrimagnetic materials B-H curve. Applications of Dielectric and Magnetic materials	**4**	**CO5**

Text Books:

1. Perspectives of Modern Physics - Arthur Beiser (TMH), 2001
2. David Griffiths, Introduction to Electrodynamics, PHI 2004

3. Introduction to Solid State Physics (VII Ed.) - Charles Kittel (John Wiley)., 2007

Suggested Reference Books:

1. Halliday and Resnick, Physics, 1981
2. W. Saslow, Electricity, magnetism and light

Reference Books:

1. Classical Electrodynamics, By J D Jackson, Wiley Publishers, 1970
2. Fundamentals of Magnetism- B. Cullity – Addison-Wiley Publishing, 2008
3. Semiconductor devices, physics and technology, S. M. Sze Wiley, 1981
4. Introduction to solid state physics AJ DEKKER 2011

Note for Examiner(s): Question paper will comprise three sections,

1. Section-A will be compulsory and comprise 4-short answer type questions uniformly spread to the entire syllabus.

2. Section-B will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on concepts, definitions, derivations, principles, construction and working etc.

3. Section-C will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on derivations, numerical and applications of the various topics covered therein.

Note for Students:

1. Section – A is compulsory and attempt/answer all the four questions carrying 12 marks in total.

2. Attempt/answer two questions each out of the Section – B and Section – C. All questions will carry 12 marks each.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-BS-105	**Course Name: Engineering Chemistry**	**L**	**T**	**P**	**C**
		3	**1**	**-**	**4**
Year and Semester	**1st Yr.** **2nd Semester**	**Contact hours per week:** (4Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 40	**SEE: 60**		

Course Objectives:	
The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools.	
Technology is being increasingly based on the electronic, atomic and molecular level modifications.	
Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels.	
Course Outcomes: On completion of the course, student would be able to:	
CO1	Analyze microscopic chemistry in terms of atomic and molecular orbitals and inter molecular forces.
CO2	Apply the knowledge of conductance to explain various electrochemical phenomenon.
CO3	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
CO4	Rationalize bulk properties and processes using thermodynamic considerations.
CO5	Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
CO6	Distinguish between various stereoisomers.

Module No	**COURSE SYLLABUS CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Atomic and molecular structure:** Schrodinger equation. Particle in a one-dimensional box solution and its applications for molecules. Molecular orbital theory and its applications to the formation of homonuclear (H_2, N_2) and heteronuclear diatomic molecules (NO, CO, CN) Energy level diagrams of diatomics. Pi (p)-molecular orbitals.	**10**	**CO1, CO2**
2	**Spectroscopic techniques and applications:** Principles of spectroscopy and selection rules. Electronic spectroscopy. Spectroscopy and its applications in medicine. Applications of Nuclear magnetic resonance (NMR) and magnetic resonance imaging (MRI), surface characterization with electron spectroscopy (Mass Spectrometry (MS).	**10**	**CO3**
3	**Electrochemistry:** Conductance of electrolytic solutions, Transference number and its determination by Hittorf method and Moving boundary method, Kohlrausch's law of independent migration of ions, Interionic attraction theory, activity and activity coefficients of strong electrolytes.	**10**	**CO4**

4	**Periodic properties:** Effective nuclear charge, penetration of orbitals, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries **Stereochemistry:** Representations of 3-dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity,	**8**	**CO4, CO5**

Text Books:

1. University chemistry, by B. H.Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N.Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M.S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Note for Examiner(s): Question paper will comprise three sections,

1. Section-A will be compulsory and comprise 4-short answer type questions uniformly spread to the entire syllabus.
2. Section-B will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on concepts, definitions, derivations, principles, construction and working etc.
3. Section-C will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on derivations, numerical and applications of the various topics covered therein.

Note for Students:

1. Section – A is compulsory and attempt/answer all the four questions carrying 12 marks in total.
2. Attempt/answer two questions each out of the Section – B and Section – C. All questions will carry 12 marks.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-HSM-107	**Course Name: English for Technical Writing**	**L**	**T**	**P**	**C**
		2	**-**	**-**	**2**
Year and Semester	**1st Yr.** **1st Semester**	**Contact hours per week:** (2Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 40	**SEE: 100**		

Course Objectives:	
To make student understand the details of functional English.	
To make student learn the effective communication skills	
Course Outcomes: On completion of the course, student would be able to:	
CO1	The student will acquire basic proficiency in English
CO2	Writing and speaking skills
CO3	Reading and listening skills
CO4	Vocabulary enrichment

Module No	**COURSE SYLLABUS CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Vocabulary Building:** The concept of Word Formation Root words from foreign languages and their use in English Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.	**3**	**CO1, CO2, CO3, CO4**
2	**Basic Writing Skills:** Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely	**5**	**CO2**
3	**Identifying Common Errors in Writing:** Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés	**4**	**CO1**
4	**Nature and Style of sensible Writing:** Describing, Defining, Classifying, Providing examples or evidence, writing introduction and conclusion	**5**	**CO1, CO2**
5	**Writing Practices:** Comprehension, Précis Writing, Essay Writing	**3**	**CO1, CO2**
6	**Oral Communication** (This unit involves interactive practice sessions in Language Lab): Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations	**4**	**CO1, CO3**

Text Books:

1. Practical English Usage. Michael Swan. OUP.1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book.2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.2006.

5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press.2011.
6. ExercisesinSpokenEnglish.Parts.I-III.CIEFL,Hyderabad.OxfordUniversityPress

Note for Examiner(s): Question paper will comprise three sections,

1. Section-A will be compulsory and comprise 4-short answer type questions uniformly spread to the entire syllabus.
2. Section-B will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on concepts, definitions, derivations, principles, construction and working etc.
3. Section-C will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on derivations, numerical and applications of the various topics covered therein.

Note for Students:

1. Section – A is compulsory and attempt/answer all the four questions carrying 12 marks in total.
2. Attempt/answer two questions each out of the Section – B and Section – C. All questions will carry 12 marks.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-BS-109	**Course Name: Mathematics-I**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**
Year and Semester	**1st Year** **1st Semester**	**Contact hours per week:** (4 Hrs) Exam: (3 Hrs)			
Pre-requisite of course	The course requires prior knowledge of Differentiation, Integration and vector algebra.	**Evaluation**			
		CIE: 40	**SEE: 60**		

Course Objectives:	
1. To apply Differentiation to geometric principles and expand functions into series.	
2. To understand Partial differentiation and apply to various mathematical situations.	
3. To gain knowledge on fundamentals of Multiple Integrals and their Applications.	
4. To explore how to differentiate and integrate Vectors. To provide good understanding of interrelation between vector differentiation and Integration through Basic Theorems.	
Course Outcomes: On completion of the course, student would be able to:	
CO1	Understand the Differentiation and Integration applications.
CO2	Understand and solve Partial differentiation and Multiple integrals for various problems.
CO3	Apply the knowledge of Differentiation to geometric principles and expand functions into series.
CO4	Students should be able to use his knowledge of Vector analysis and relate it to fluid flows.

Module No	**COURSE SYLLABUS CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Applications of Differentiation:** Taylor's & Maclaurin's series, Expansion by use of known series, Expansion by forming a differential equation, Asymptotes, Curvature, Tracing of Cartesian curves.	**6**	**CO1, CO2, CO3**
2	**Partial Differentiation & its Applications:** Euler's theorem, Jacobian, Errors and approximations, Maxima-minima of functions of two variables, Lagrange's method of undetermined multipliers.	**6**	**CO1, CO2, CO3**
3	**Double Integral:** Change of order of integration Double integral in polar coordinates, Applications of double integral to find area enclosed by plane curves volume of solids of revolution. **Triple integral:** Volume of solids,	**6**	**CO1, CO2, CO3**
4	**Vector Calculus**: Differentiation of vectors: Gradient of a scalar field and directional derivative, divergence, and curl of a vector field, Del applied twice to point functions, Del applied to product of point functions. **Integration of vectors:** line integral, surface integral, volume integral, Green's, Stoke's and Gauss divergence theorems (without proof).	**6**	**CO1, CO2, CO3, CO4**

TEXT BOOKS:

1. Advanced Engineering Mathematics: E. Kreyszig. 10th Edition, John Wiley & sons,
2. Higher Engineering Mathematics: B.S. Grewal. 43rd Edition, Khanna Publications

REFERENCE BOOKS:

1. Engineering Mathematics Part-I: S.S. Sastry, 4th Edition, PHI.
2. Advanced Engineering Mathematics: R.K. Jain, S.R.K. Iyengar, 3rd Edition, Narosa Publications
3. Advanced Engineering Mathematics: Michael D. Greenberg, 2nd Edition, Pearson Publications.

Note for Examiner(s): Question paper will comprise three sections,

1. Section-A will be compulsory and comprise 4-short answer type questions uniformly spread to the entire syllabus.

2. Section-B will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on concepts, definitions, derivations, principles, construction and working etc.

3. Section-C will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on derivations, numerical and applications of the various topics covered therein.

Note for Students:

1. Section – A is compulsory and attempt/answer all the four questions carrying 12 marks in total.

2. Attempt/answer two questions each out of the Section – B and Section – C. All questions will carry 12 marks.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-PRES-01	**Course Name:** Basic Electrical Engineering Lab	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**
Year and Semester	**1st Year** **1st Semester**	**Contact hours per week:** (2Hrs) **Exam:** (3hrs.)			
Pre-requisite of course	**Basic Science**	**Evaluation**			
		CIE: 20	**SEE: 30**		

Course Objectives:

1. To study the different laws and theorems of electric networks.
2. To familiarize with different DC and AC electric networks
3. To study different electric equipments and their application.
4. Familiarize with the safety rules for electrical laboratory.

Course Outcomes: On completion of the course, student would be able to:

CO1	Impart the conceptual knowledge of electric circuit laws and network theorems and apply these to laboratory work.
CO2	Ability to analyze the performance of an electric circuits as well as handling of electric equipments.
CO3	Acknowledge the principles of operation and the main features of electric network and their applications.
CO4	Get an exposure to common electrical components and their ratings. Develop skills to use in different technological field.

Expt. No	**COURSE SYLLABUS** **CONTENTS OF MODULE**	**COs**
1	To study and verify Kirchhoff's current law and Kirchhoff's voltage law.	**CO1 CO2 CO3 CO4**
2	To study and verify Thevenin's theorem.	
3	To study and verify Norton's theorem.	
4	To study and verify Superposition theorem.	
5	To study and verify Maximum power transfer theorem.	
6	To study the operation of series RLC network and determine its parameters.	
7	To study the operation of parallel RLC network and determine its parameters.	
8	To study the characteristics of series RLC network under resonance condition and determine its resonance frequency from resonance curve.	
9	To study the characteristics of parallel RLC network under resonance condition and determine its resonance frequency from resonance curve.	
10	Perform three phase power measurement by using two wattmeter's method for balanced three phase load.	
11	To study the basic operation and equivalent circuit of a single-phase transformer.	
12	Perform Open Circuit & Short Circuit tests on single phase transformer.	
13	Perform Load test on single phase transformer.	
14	To study the characteristics of fluorescent lamps.	
15	To study the characteristics of tungsten filament lamps.	

Text/Reference Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
   L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-PRBS-03	**Course Name: Electromagnetics Lab**	**L**	**T**	**P**	**C**
		-	**-**	**2**	**1**
Year and Semester	**1st Yr. 1st Semester**	**Contact hours per week:** (2Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 20	**SEE: 30**		

Course Objectives:

1. Understand the applications of Optics
2. Understand components of a laser system and their applications
3. Understand to measure conductivity in semiconductors
4. Understand basics of quantum principles

Course Outcomes: On completion of the course, student would be able to:

CO1	Experiments in Basic Physics
CO2	Experiments in acoustics/ applications
CO3	Experiments in Electromagnetics
CO4	Experiments in Magnetism/ applications
CO5	Experiments in Semiconductor properties

Expt. No	**COURSE SYLLABUS CONTENTS OF MODULE**	**COs**
1	Magnetic field from Helmholtzcoil; To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus	**CO1 CO2 CO3 CO4**
2	To compare the capacitances of two capacitors by Density bridge and hence to find the dielectric constant of a medium.	
3	To find the frequency of A.C. mains by using sonometer.	
4	To Find Value of high Resistance by substitution method	
5	To Find the value of high resistance by leakage method	
6	To Convert a galvanometer in to an Ammeter of given range.	
7	To find the value of e/m for electrons by Helical method, Measurement of Lorentz force in a vacuum tube.	
8	To find the ionization potential of Mercury using a thyratron tube...	
9	To find the value of Planck's constant by using a photo electric cell.	
10	To find the value of Hall Co-efficient of semi-conductor.	
11	To find the band gap of intrinsic semi-conductor using four probe method.	
12	Post-office Box	
13	To calculate the hysteresis loss by tracing a B-H curve.	
14	Electric Field Pattern Between Two Circular Electrodes	
15	Electric Field between Parallel Conductors	
16	Electric Field And Potential Inside The Parallel Plate Capacitor	
17	Capacitance And Inductance Of Transmission Lines	
18	Magnetic Field Outside A Straight Conductor	
19	Magnetic Field Of Coils	
20	Magnetic Induction	
21	Hertz's Experiment to demonstrate the production and reception of radio waves	
22	Wireless RF Transmitter and Receiver	
23	Simple AM Transmitter / Receiver	

Text Books:

1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
2. Practical Physics – S.L.Gupta &V.Kumar (Pragati Prakashan).
3. Advanced Practical Physics Vol.I& II – Chauhan &Singh (Pragati Prakashan).

2	To find the wavelength of sodium light by Newton’s rings experiment.
3	To find the wavelength of sodium light by Fresnel's biprism experiment.
4	To find the wavelength of various colours of white light with the help of a plane transmission diffraction grating.
5	To find the wavelength of sodium light by Michelson interferometer.
6	To find the resolving power of a telescope.
7	To find the specific rotation of sugar solution by using a polarimeter.
13	To study laser beam characteristics, diffraction.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-PRBS-05	**Course Name: Engineering Chemistry Lab**	**L**	**T**	**P**	**C**
		-	-	2	1
Year and Semester	**1st Yr.** **2nd Semester**	**Contact hours per week:** (2Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 20		**SEE: 30**	

Course Objectives:

To teach the fundamentals of basic chemical sciences with hand on experience essential for the development of new technologies to Electrical and Instrumentation engineering.

Course Outcomes: On completion of the course, student would be able to:

CO1	Measuremolecular/system properties such as surfacetension,viscosity, conductance and pH of solutions, alkalinity, chloride content, dissolved oxygen, hardness of water,etc.
CO2	Identify the number of compounds in a mixture using TLC.
CO3	Synthesize a small drug molecule and polymer resin.
CO4	Determine the amount of solute in a solution using spectrophotometers.
CO5	Measure the kinematic viscosity, pour and cloud point of oil.

Expt. No	**COURSE SYLLABUS CONTENTS OF MODULE**	**COs**
1	To determine the relative viscosity of a given liquid using Ostwald viscometer.	**CO1, CO2, CO3, CO4, CO5**
2	Using Redwood viscometer determine the viscosity of an oil sample.	
3	To determine the surface tension of a giving liquid using stalagmometer.	
4	To determine the alkalinity of a given water sample.	
5	To identify the number of components, present in a given organic mixture by Thin Layer Chromatography (TLC).	
6	Determination of strength of a given HCl solution by titrating it with a standardized NaOH solution using conductivity meter.	
7	To determine the strength of a given acid solution by titrating it with a base using pH meter.	
8	Synthesis of a drug (Aspirin/Paracetamol).	
9	To prepare Phenol-formaldehyde and Urea formaldehyde resin.	
10	Determination of chloride content of a given water sample.	
11	To determine temporary and permanent hardness of a given water sample by EDTA method.	
12	Determination of the partition coefficient of a substance for its distribution between two immiscible solvents.	
13	To find out the content of sodium and potassium in a given salt solution by Flame Photometer.	
14	To verify Beer-Lambert law and determine the □max and concentration of unknown solution of KMnO4 using a spectrophotometer.	
15	To determine the amount of dissolved oxygen present in a given water sample.	
16	To find out the pour point and cloud point of a lubricating oil.	

SUGGESTED BOOKS:

1. A Text Book on Experimental and Calculation – Engineering Chemistry, S.S. Dara, S. Chand & Company (Ltd.)
2. Essential of Experimental Engineering Chemistry, Shashi Chawla, Dhanpat Rai Publishing Company.
3. Theory & Practice Applied Chemistry – O.P. Virmani, A.K. Narula (New Age)

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-PRHSM-07	**Course Name: English Language Lab.**	**L**	**T**	**P**	**C**
		-	**-**	**2**	**1**
Year and Semester	**1st Yr. 1st Semester**	**Contact hours per week:** (2Hrs)			
Pre-requisite of course	Functional English	**Evaluation**			
		CIE: 50	**SEE: --**		

Course Objectives:

1. Graduates will attain skills to conduct experiments/investigations and interpret data with reference to systems and standards
2. Graduates will have ability to communicate effectively in written, oral and instrumentation formats to put forth solutions and prepare detailed engineering report in the process and automation industries.
3. Graduates will be able to apply the knowledge, skill and attitude as a team player in initiating, executing and managing projects in the areas of design, manufacture, marketing and entrepreneurship in multi-disciplinary environments.

Course Outcomes: On completion of the course, student would be able to:

CO1	Imparting the role of communicative ability as one of the soft skills needed for placement
CO2	Developing communicative ability and soft skills needed for placement
CO3	Making students Industry-Ready through inculcating team-playing capacity

Expt. No	**COURSE SYLLABUS CONTENTS OF MODULE**	**COs**
1	**GRAMMAR IN COMMUNICATION:** Grammar and Usage – Building Blocks, Homonyms, Subject and Verb Agreement, Error Correction - Grammar Application, Framing Questions – Question words, Verbal Questions, Tags, Giving Replies – Types of Sentences, Listening Comprehension –Listening and Ear training.	**CO1, CO2, CO3**
2	**ASSERTIVE COMMUNICATION:** Listening Comprehension in Cross–Cultural Ambience, Telephonic Conversations/Etiquette, Role Play Activities, Dramatizing Situations- Extempore – Idioms and Phrases	
3	**CORPORATE COMMUNICATION:** Video Sensitizing, Communicative Courtesy – Interactions – Situational Conversations, Time Management, Stress Management Techniques, Verbal Reasoning, Current Affairs – E Mail Communication / Etiquette	
4	**PUBLIC SPEAKING:** Giving Seminars and Presentations, Nuances of Addressing a Gathering - one to one/ one to a few/ one to many, Communication Process, Visual Aids & their Preparation, Accent Neutralization, Analyzing the Audience, Nonverbal Communication.	
5	**INTERVIEW & GD TECHNIQUES:** Importance of Body Language –Gestures & Postures and Proxemics, Extempore, Facing the Interview Panel, Interview FAQs, Psychometric Tests and Stress Interviews, Introduction to GD, Mock GD Practices.	

Text Books:

1. Bhatnagar R.P. & Rahul Bhargava, "English for Competitive Examinations", Macmillian Publishers, India, 1989, ISBN: 9780333925591
2. Devadoss K. & Malathy P., "Career Skills for Engineers", National Book Publishers, Chennai, 2013.
3. Aggarwal R.S., "A Modern Approach to Verbal & Non–Verbal Reasoning", S.Chand Publishers, India, 2012, ISBN : 8121905516

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-BS-102	**Course Name:** Semiconductor Physics	**L**	**T**	**P**	**C**
		3	**1**	**-**	**4**
Year and Semester	**1st Yr.** **2nd Semester**	**Contact hours per week:** (4Hrs) Exam: (3 Hrs)			
Pre-requisite of course	EE-BS-101, Physics-I First Semester, Introduction to Solid State Physics	**Evaluation**			
		CIE: 40	**SEE: 60**		

Course Objectives:

1. To impart the basic concepts of Semi-Conductor Electronics.
2. To lay the foundation to understand the various semi-conductor devices.
3. To impart the basic concept of design and study of various circuits in Electronics.
4. To lay the foundation for the advance courses in electronics.

Course Outcomes: On completion of the course, student would be able to:

CO1	Understand the principles of semiconductor Physics and foundation of various semi-conductor devices.
CO2	Understand transistors as an amplifier and as a switch and various design parameter of an amplifier.
CO3	Know the concept of feedback in amplifier and oscillator and design of different oscillator.
CO4	Understand the constructional geometry of FET family and FET amplifier circuit with a view towards reduced power consumption.

Module No	**COURSE SYLLABUS CONTENTS OF MODULE**	**Hrs**	**COs**
1	Semiconductors p-type and n-type, pn junction diodes and energy band structure, pn junction as a circuit element and its characteristics, half wave and full wave rectifier circuits, basic filter circuits, clipper & clamper circuit. Zener diode and its applications as a voltage regulator. LED its characteristics construction & applications.	**6**	**CO1**
2	Transistor PNP and NPN- its fabrication and Characteristics in different configurations. Biasing in transistors, Concept of d.c. and a.c. load line and operating point selection. Transistor action as an amplifier and as a switch, Various amplifiers configurations, Design of amplifier and determination of parameters voltage gain current gain input resistance and output resistance & power gain.	**6**	**CO2**
3	Concept and need of feedback in amplifiers, Types of feedback in amplifiers, their effect on the amplifier parameters with their advantages and disadvantages, Cascading in amplifiers, Frequency response of RC Coupled amplifiers with explanation, Oscillators circuits and their types with explanation on their design difference, Multivibrators and their types, design and their applications.	**6**	**CO2 CO3**
4	Field Effect Transistors, Constructions and their types, Characteristics of JFET, MOSFET their types and Various amplifier configurations using FET. Characteristics and Construction of SCR, TRIAC, UJT and their basic areas applications.	**6**	**CO4**

Reference Books:

1. Electronic Devices & Circuits - Boylstad & Nashelsky.
2. Integrated Electronics By Millman & Halkias.
3. Electronic Principles – Malvino
4. Principles of Electronics – V.K. Mehta, Shalu Melta.
5. Solid State Electronics- Manera, Mc Graw Hill Publ.
6. Electronic Circuits – Donald L. Shilling & Charles Beowl

Note for Examiner(s): Question paper will comprise three sections,

1. Section-A will be compulsory and comprise 4-short answer type questions uniformly spread to the entire syllabus.

2. Section-B will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on concepts, definitions, derivations, principles, construction and working etc.

3. Section-C will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on derivations, numerical and applications of the various topics covered therein.

Note for Students:

1. Section – A is compulsory and attempt/answer all the four questions carrying 12 marks in total.

Attempt/answer two questions each out of the Section – B and Section – C. All questions will carry 12 marks.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-ES-104	**Course Name:** Programming for Problem Solving	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**
Year and Semester	**1st Year** **IInd Semester**	**Contact hours per week:** (4Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 40		**SEE: 60**	

Course Objectives:	
1. To explain the problem solving concepts using a computer.	
2. To develop problem solutions for the computer by using problem solving tools.	
3. To describe the Programming structure of C language.	
4. To convert an Algorithm, Pseudo code and Flowchart into a C program	
5. To find errors and execute a C program	
Course Outcomes: On completion of the course, student would be able to:	
CO1	Understand the fundamental concepts of computer hardware and number systems.
CO2	Apply the basic programming skills of C Language in problem solving.
CO3	Use different data types, decision structures, loops, arrays, strings and functions of C-programming to design a computer program.
CO4	Apply dynamic memory concepts with pointers.
CO5	Apply various algorithms in solving sorting problems.
CO6	Apply linear data structures like Stack, Queues and Trees in organizing and traversing data.

Module No	**COURSE SYLLABUS** **CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Generations and Classification of Computers** - Applications of Computers - Basic Organization of a Computer - Number system - Binary, Decimal, Octal and Hexadecimal – Problems **Introduction to C Language**: Algorithm, Flowchart, Pseudo-code solution to problem, Basic concepts of a C program, Declaration, Assignment & Print statement, Types of operators and expressions, Programming examples and exercise. **Branching and Looping:** Two-way selection (if, if- else, nested if- else, cascaded if-else), switch statement, ternary operator? Goto, Loops (For, do- while, while) in C, break and continue, programming examples and exercises.	**9**	**CO1, CO2, CO3**
2	**Functions:** User defined functions-function definition, function declaration,function call, Formal and actual parameters, Categories of functions, Passing parameters to functions- Pass by value, Pass by reference, Recursion- types of recursion, programming example s and exercises. **Arrays and Strings:** Arrays: Classification of arrays, Storing value in arrays, Using arrays with Functions- passing individual elements of array, passing the whole array, Multidimensional arrays-addition and multiplication of matrices, **Searching and Sorting**-Linear search, Binary search, Bubble sort, String: Declaring, Initializing, Printing and reading strings,	**9**	**CO2,CO3, CO5**

	String input and output functions, String handling functions, Arrays of strings, programming examples and Exercises.		
3	**Structures and File Management**: Basics of structures-structure data types, type definition, accessing structures, Structure operations, Complex structures-nested structures, structures containing arrays, Array of structures, Structures and Functions, **File Management:** Creating a file, Declaring file pointer variable, Modes of a file, Opening and closing the files, Input and output operations, Programming examples and exercises.	**9**	**CO3,CO4**
4	**Pointers:** Pointers concepts, Pointers and functions, Arrays and pointers, address arithmetic, Character pointer and functions, Pointers to pointer, Dynamic allocations methods- malloc(), calloc(), realloc(),free(), Array of pointers, **Introduction to Data Structures:** Primitive and non-primitive data types, Definition and applications of Stacks, Queues, Linked Lists and Trees	**9**	**CO4,CO6**

Text Books:

1. "The C Programming Language", BrianW. Kernighan and Dennis M. Ritchie, 2nd Edition, PHI, 2012.
2. "Problem Solving with C ", Jacqueline Jones &Keith Harrow, 1stEdition, Pearson2011.
3. "Let Us C" , by Yashavant Kanetkar, 5th Edition, BPB

Reference Books:

1. "Computer Concepts and C Programming", Vikas Gupta, Dreamtech Press2013.
2. "Programming with C ", R. S. Bichkar, University Press,2012.
3. "Computer Programming in C ", V. Rajaraman, PHI, 2013.

Note for Examiner(s): Question paper will comprise three sections,

1. Section-A will be compulsory and comprise 4-short answer type questions uniformly spread to the entire syllabus.
2. Section-B will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on concepts, definitions, derivations, principles, construction and working etc.
3. Section-C will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on derivations, numerical and applications of the various topics covered therein.

Note for Students:

1. Section – A is compulsory and attempt/answer all the four questions carrying 12 marks in total.
2. Attempt/answer two questions each out of the Section – B and Section – C. All questions will carry 12 marks.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-ES-106	**Course Name:** Engineering Graphics and Design	**L**	**T**	**P**	**C**
		2	**-**		**2**
Year and Semester	**1st Yr.** **1st Semester**	**Contact hours per week:** (2Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 40	**SEE: 60**		

Course Objectives:
1. To make students understand about construction of various types of Curves and scales.
2. To make students understand about orthographic projections of Point, Line, Plane and regular solids.
3. To make students understand about sectional views and development of right regular solids

Course Outcomes: On completion of the course, student would be able to:	
CO1	To learn about construction of various types of Curves and scales.
CO2	To learn about orthographic projections of Point, Line and Plane
CO3	To learn about orthographic projections of regular solids.
CO4	To learn about sectional views and development of right regular solids

Module No	**COURSE SYLLABUS** **CONTENTS OF MODULE**	**COs**
1	**Introduction to Engineering Drawing covering:** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;	**CO1, CO2, CO3, CO4**
2	**Orthographic Projections covering:** Principles of Orthographic Projections-Conventions - Projections of Points and Projection of lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;	
3	**Projections of Regular Solids:** those inclined to both the Planes- (Pyramid, Prism, Cone and Cylinder) Auxiliary Views. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.	
4	**Section of Solids:** Sectional View of simple right regular solids, Development of Surfaces of right regular solids (Pyramid, Prism, Cone and Cylinder)	

Suggested Text/Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMHPublication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-HSM-108	**Course Name: Universal Human Values-II: Understanding Harmony and Ethical Human Conduct**	**L**	**T**	**P**	**C**
		3	**--**	**0**	**3**
Year and Semester	**1st year 2nd Semester**	**Contact hours per week:** (3Hrs) **Exam:** (3hrs.)			
Pre-requisite of course	**Nil**	**Evaluation**			
		CIE: 40	**SEE: 60**		

Course Objectives:

1. To create an awareness on Engineering Ethics and Human Values
2. To understand social responsibility of an engineer.
3. To appreciate ethical dilemma while discharging duties in professional life.

Course Outcomes: After successful completion of this course, the students should be able to

CO1	Understand the ethical theories and concepts
CO2	Understand an engineer's work in the context of its impact on society
CO3	Understand and analyse the concepts of safety and risk
CO4	Understand the professional responsibilities and rights of Engineers
CO5	Understand the concepts of ethics in the global context.

Module No	COURSE SYLLABUS ;; CONTENTS OF MODULE	Hrs	COs
1	**ENGINEERING ETHICS AND THEORIES** Definition, Moral issues, Types of inquiry, Morality and issues of morality, Kohlberg and Gilligan's theories, consensus and controversy, Professional and professionalism, moral reasoning and ethical theories, virtues, professional responsibility, integrity, self-respect, duty ethics, ethical rights, self-interest, egos, moral obligations	**8 Hrs**	
2	**SOCIAL ETHICS AND ENGINEERING AS SOCIAL EXPERIMENTATION :** Engineering as social experimentation, codes of ethics, Legal aspects of social ethics, the challenger case study, Engineers duty to society and environment. **SAFETY:** Safety and risk – assessment of safety and risk – risk benefit analysis and reducing risk – the Three Mile Island and Chernobyl case studies. Bhopal gas tragedy.	12 Hrs	
3	**RESPONSIBILITIES AND RIGHTS OF ENGINEERS** Collegiality and loyalty – respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee rights – Intellectual Property Rights (IPR) – discrimination	8 Hrs	
4	**GLOBAL ISSUES AND ENGINEERS AS MANAGERS, CONSULTANTS AND LEADERS :** Multinational Corporations – Environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – Engineers as trend setters for global values.	8 Hrs	

Reference Books:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering". (2005) McGraw-Hill, New York.
2. John R. Boatright, "Ethics and the Conduct of Business", (2003) Pearson Education, New Delhi.
3. Bhaskar S. "Professional Ethics and Human Values", (2005) Anuradha Agencies, Chennai.
4. Charles D. Fleddermann, "Engineering Ethics", 2004 (Indian Reprint) Pearson Education / Prentice Hall, New Jersey.
5. Charles E. Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and cases", 2000 (Indian Reprint now available) Wadsworth Thompson Learning, United States.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EI-BS-110	Course Name: Mathematics-II	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**
Year and Semester	**Ist Year** **IInd Semester**	**Contact hours per week:** (4Hrs) Exam: (3 Hrs)			
Pre-requisite of course	The course assumes prior knowledge of topics in Matrices, Differentiation, Partial Fractions, Partial Differentiation.	**Evaluation**			
		CIE: 40	**SEE: 60**		

Course Objectives:	
1.	To explore the Properties of Matrices.
2.	To know various basic Differential equations and solve them.
3.	To gain knowledge on Laplace transformations and ability to apply them in various problems
4.	To provide good understanding of Linear and non-linear Partial Differential equations.
Course Outcomes: On completion of the course, student would be able to:	
CO1	Understand significance and Solve for different Matrix properties
CO2	Differentiate between linear and non-linear differential equations and solve them.
CO3	Understand and apply Laplace Transformations and use them to solve Differential equations.
CO4	Differentiate between linear and non-linear partial differential equations, form them related to in hand problems and solve them.

Module No	**COURSE SYLLABUS** **CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Matrices & its Applications:** inverse using elementary transformations, consistency of linear system of equations, linear and orthogonal transformations, Eigen values and Eigen vectors, properties of Eigen values.	**6**	**CO1**
2	**Ordinary Differential Equations & its Applications:** Exact differential equations. Equations reducible to exact differential equations. **Linear differential equations of second and higher order**: complementary function and particular integral, method of variation of parameters to find particular Integral, Cauchy and Legendre linear differential equations, Simultaneous linear Differential equation with constant co-efficients.	**6**	**CO2**
3	**Laplace Transforms and its Applications:** Transforms of derivatives, transforms of integrals, multiplication by t^n, division by t. Evaluation of integrals by Laplace transforms. Laplace transform of Unit step function, unit impulse function and periodic function. **Inverse Laplace transforms**, convolution theorem, application to linear differential equations	**6**	**CO3**
4	**Partial Differential Equations and Its Applications:** Formation of partial differential equations, Lagrange's linear partial differential equation, First order non-linear partial differential equation, Method of separation of variables and its applications.	**6**	**CO4**

TEXT BOOKS:

1. Advanced Engineering Mathematics: E. Kreyszig, 10th Edition, John Wiley & son
2. Higher Engineering Mathematics: B.S. Grewal. 43rd Edition, Khanna Publication

REFERENCE BOOKS:

1. Engineering Mathematics Part-I : S.S. Sastry, 4th Edition, PHI.
2. Advanced Engineering Mathematics: R.K. Jain, S.R.K. Iyengar, 3rd Edition, Narosa Publications
3. Advanced Engg. Mathematics: Michael D. Greenberg, 2nd Edition, Pearson Publications.

Note for Examiner(s): Question paper will comprise three sections,

1. Section-A will be compulsory and comprise 4-short answer type questions uniformly spread to the entire syllabus.

2. Section-B will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on concepts, definitions, derivations, principles, construction and working etc.

3. Section-C will comprise 4-questions uniformly spread to the entire syllabus and questions will be based on derivations, numerical and applications of the various topics covered therein.

Note for Students:

1. Section – A is compulsory and attempt/answer all the four questions carrying 12 marks in total.

2. Attempt/answer two questions each out of the Section – B and Section – C. All questions will carry 12 marks.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EI-PRES-02	**Course Name:** Semiconductor Physics Lab	**L**	**T**	**P**	**C**
		-	**-**	**2**	**1**
Year and Semester	**1st Yr.** **2nd Semester**	**Contact hours per week:** (2Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 20	**SEE: 30**		

Course Objectives:	
1. Ability to identify the basic electronic components.	
2. Ability to work on the basic electronic equipments.	
3. Ability to get the electronic circuit concepts.	
4. Ability to design the basic circuit in electronics.	
Course Outcomes: On completion of the course, student would be able to:	
CO1	Well verse with the use of the electronic components and equipments.
CO2	Well verse with the fundamentals and the parameters of components related to their fabrication and construction.
CO3	Able to start with the basic design concepts circuits operations.

Expt. No	**COURSE SYLLABUS** **CONTENTS OF MODULE**	**COs**
1	Familiarization of the basic electronic components and electronic lab equipments like Functional Generators, CRO, Power supplies, mustimeters etc.	**CO1, CO2, CO3**
2	Draw and study the forward and reverse characteristics of the PN Diode.	
3	To draw and study the clipping circuits in various modes.	
4	To draw and study the clamping circuits in positive and negative mode.	
5	To draw and study the differentiating and integrating circuits.	
6	To draw and study the low pass and high pass filters.	
7	To design and study the half and full wave rectifier	
8	To design and study the effect of various filter circuits on rectifiers performance.	
9	To study the characteristics of pnp and npn transistors in CE mode and determine h parameters from characteristics.	
10	To study the characteristics of pnp and npn transistors in CB mode and determine h parameters from characteristics.	
11	To design and study the RC coupled CE amplifier and measure its voltage and current gain.	
12	To design and study Hartley oscillator.	
13	To design and study Phase shift oscillator.	
14	To measure the effect of negative feedback on amplifier in RC coupled current series mode.	

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-PRES-04	**Course Name:** Programming for Problem Solving Lab	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**
Year and Semester	**1st Year** **2nd Semester**	**Contact hours per week:** (2Hrs) **Exam:** (3hrs.)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 20		**SEE: 30**	

Course Objectives:
1. To write C programs to solve the problems
2. To compile and execute programs in C
3. To identify the syntax errors and semantic errors
4. To debug the program in C
5. To write C programs to solve the problems

Course Outcomes: On completion of the course, student would be able to:	
CO1	Use flowcharts to solve computational problems.
CO2	Create and develop algorithms with arithmetic and logical operators.
CO3	Analyse and implement an algorithm with data types, decision structures, loops, arrays, strings and functions.
CO4	Design and develop algorithms using predefined or user-defined functions to solve problems on sorting, searching and file processing.

Expt. No	**COURSE SYLLABUS** **CONTENTS OF MODULE**	**COs**
1	Write a C program to compute roots of quadratic equation $ax^2+bx+c=0$, where *a*, *b*, and *c* are three coefficients of a quadratic equation are inputs.	**CO1, CO2, CO3, CO4**
2	Design and develop an algorithm to find the *reverse* of an integer number.	
3	Design and develop an algorithm to check whether given number is PALINDROME or NOT, Implement a C program for the developed algorithm that takes an integer number as input and output the reverse of the same with suitable messages. Ex: Num: 2019, Reverse: 9102, Not a Palindrome.	
4	Design and develop a c program to implement simple calculator using switch case statement.	
5	Draw the flowchart and Write a C Program to compute Sin(x) using Taylor series approximation given by Sin(x) = x - (x^3/3!) + (x^5/5!) - (x^7/7!) + …….	
6	Develop, implement and execute a C program to search a Number in a list using *linear searching* Technique.	
7	Develop an algorithm, implement and execute a C program that reads *N* integer numbers and arrange them in ascending order using *Bubble Sort*.	
8	Design and develop a C program to read and print a matrix and check whether a given Matrix is a sparse Matrix or not.	
9	Write and execute a C program to display Pascal Triangle using for loop.	
10	Write a C program to implements the following string manipulation functions till the use wishes to continue (infinite loop): (i) *strcpy*() (ii) srrlen() (iii) strrev () (iv) strcmp() (v) strcat(). Read a sentence and print frequency of vowels and total count of consonants.	
11	Design and develop a C function *RightRotate (x, n)* that takes two integers *x* and *n* as input and returns value of the integer *x* rotated to the right by *n* positions. Assume the integers are unsigned.	

12	Draw the flowchart and write a *recursive* C function to find the factorial of a number, *n*!, define by *fact*(*n*)=1, if *n*=0. Otherwise *fact* (*n*) =*n***fact* (*n*-1). Using this function, write a C program to compute the binomial coefficient ${}^{n}C_{r}$. Tabulate the results for different values of *n* and *r* with suitable messages	
13	Given two university information files such as "studentname.txt" and "usn.txt" that contains students Name and USN respectively. Write a C program to create a new file called "output.txt" and copy the content of files "studentname.txt" and "usn.txt" into output file in the sequence shown below. Display the contents of output file "output.txt" on to the screen. Student Name USN Name 1 USN1 Name 2 USN2…. ….	
14	**a.** Write a C program to maintain a record of n student details using an array of structures with four fields (Roll number, Name, Marks, and Grade). Assume appropriate data type for each field. Input & Print the members of the structure **b.** Write a C program to take 2 structures HH:MM: SS as T1 & T2 & display the time difference as structure as T3.	
15	Write a C program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of n real numbers.	

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-PRES-06	**Course Name:** Engineering Graphics and Design lab	**L**	**T**	**P**	**C**
		-	**-**	**2**	**1**
Year and Semester	**1st Yr.** **2nd Semester**	**Contact hours per week:** (2Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 20	**SEE: 30**		

Course Objectives:

1. To make students understand about construction of various types of Curves and scales.
2. To make students understand about orthographic projections of Point, Line, Plane and regular solids.
3. To make students understand about sectional views and development of right regular solids

Course Outcomes: On completion of the course, student would be able to:

CO1	To learn about construction of various types of Curves and scales.
CO2	To learn about orthographic projections of Point, Line and Plane
CO3	To learn about orthographic projections of regular solids.
CO4	To learn about sectional views and development of right regular solids

Module No	**COURSE SYLLABUS CONTENTS OF MODULE**	**COs**
1	**Introduction to Engineering Drawing covering:** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;	**CO1, CO2, CO3, CO4**
2	**Orthographic Projections covering:** Principles of Orthographic Projections-Conventions - Projections of Points and Projection of lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;	
3	**Projections of Regular Solids:** **t**hose inclined to both the Planes- (Pyramid, Prism, Cone and Cylinder) Auxiliary Views. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.	
4	**Section of Solids:** Sectional View of simple right regular solids, Development of Surfaces of right regular solids (Pyramid, Prism, Cone and Cylinder)	

Suggested Text/Reference Books:

5. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
6. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
7. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMHPublication

Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-PRES-08	**Course Name: Manufacturing Processes - Workshop Lab**	**L**	**T**	**P**	**C**
		-	**-**	**2**	**1**
Year and Semester	**1st Yr. 2nd Semester**	**Contact hours per week:** (2Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 20	**SEE: 30**		

Course Objectives:

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. Upon completion of this laboratory course, students will be able to fabricate components with their ownhands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.

Course Outcomes: On completion of the course, student would be able to:

CO1	To provide the basics of manufacturing processes
CO2	To provide working knowledge of lathe machines
CO3	To provide the study of measuring tools
CO4	To study the machine tools

Expt. No	**COURSE SYLLABUS CONTENTS OF MODULE**	**COs**
1	**Lectures & videos: Detailed contents** **(i.)** Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(2 lectures)** **(ii.)** CNC machining, Additive manufacturing **(1lecture)** **(iii.)** Fitting operations & power tools **(1lecture)** **(iv.)** Plastic molding, glass cutting **(1lecture)** **(v.)** Metal casting **(1lecture)** **(vi.)** Welding (arc welding & gas welding), brazing **(1 lecture)**	**CO1, CO2, CO3, CO4**
2	To study different types of measuring tools used in metrology and determine least counts of vernier calipers, micrometers and Vernier height gauges.	
3	To study different types of machine tools (lathe, shape or planer or slotter, milling, drilling machines)	
4	To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off.	
5	To study different types of fitting tools and marking tools used in fitting practice.	
6	To prepare lay out on a metal sheet by making and prepare rectangular tray, pipe shaped components e.g. funnel.	
7	To prepare joints for welding suitable for butt welding and lap welding.	
8	To perform pipe welding.	
9	To study various types of carpentry tools and prepare simple types of at least two wooden joints.	
10	To prepare simple engineering components/ shapes by forging.	

11	To prepare mold and core assembly, to put metal in the mold and fettle the casting.	
12	To prepare horizontal surface/ vertical surface/ curved surface/ slots or V-grooves on a shaper/ planner.	
13	To prepare a job involving side and face milling on a milling machine.	

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited,Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition,2002.
3. Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education,2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4thedition, Prentice Hall India,1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

CBCS CURRICULUM (2024 -25)
Program Name: B. Tech.-Electrical Engineering

Course Code: EE-PRES-10	**Course Name: Idea Workshop/ Lab**	**L**	**T**	**P**	**C**
		-	**-**	**2**	**1**
Year and Semester	**1st Yr. 2nd Semester**	**Contact hours per week:** (2Hrs) Exam: (3 Hrs)			
Pre-requisite of course	**NIL**	**Evaluation**			
		CIE: 50	**SEE: --**		

Course Objectives:	
1.To provide all facilities under one roof for the conversion of an idea into a prototype.	
2.Training in the 21st century skills- critical thinking, problem-solving, collaboration etc.	
3.Making engineering students more curious, imaginative and creative; engineering education more engaging	
4.IDEA lab will be centered around activities and events to promote multidisciplinary education and research	
Course Outcomes: On completion of the course, student would be able to:	
CO1	Students will be able to earn skill of PCB Designing
CO2	Students will be learning to write algorithms
CO3	Students will be able to earn skill of Artificial Intelligence

List of Experiments

1. Circuits on Bread board to PCB transition.
2. To design and fabricate PCB for electronic circuits as micro project (any one)
   a) Power Supply
   b) 555 Timer based circuits
   c) Op-amp based circuits
   d) Amplifiers
   e) Any other circuit of similar nature
3. To develop algorithms in any computer language
   a) Complex Mathematical operations
   b) Matrix transformations
   c) Logic gates
   d) Numerical Methods –Interpolation (forward, backward, leap frog,) -Approximations
4. To deploy and generate AI models to implement various tasks (any two)
   a) Image classification
   b) Voice swap
   c) Image generation
   d) Neural style transfer
   e) Video to text conversion
   f) Graphics design generation
   g) Music generation
   h) any other application of similar nature

The students are required to undertake one/two task from each of the experiments in the above list and demonstrate it to score marks in the evaluation. All the projects can be undertaken on open source platforms. Any other emerging area projects may be added to the list as per the availability of resources and expertise in the University Department.

Appendix –I
Detailed first year curriculum contents
Guide to Induction Program

1. Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.[1]This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work formational needs and beyond.

The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students.

The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in the in new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

[1]A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31 March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs.

[2]Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gadhinagar since July 2011, (2) Human Values course running at IIIT

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

(ii) IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the course. The content is non-sectarian, and the mode is dialogical rather than sermonizing or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

(iii) Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member. Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop teamwork. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values

Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

provides the base.
Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but get students to explore and think by engaging the mini dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.
The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT (BHU) are noteworthy and one can learn from them.[3]
Discussions would be conducted in small groups of about 20 students with a faculty member to reach. It is too pen thinking towards these. If, Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.
Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire4-year stay and possibly beyond.

Literary
Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

Proficiency Modules
This period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

Lectures by Eminent People
This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

Visits to Local Area
A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

Familiarization to Dept./Branch &Innovations
Thestudentsshouldbetoldaboutdifferentmethodofstudycomparedtocoachingthat is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

[3]The Universal Human Values Course is a result of along series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT (BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

3. Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	**Activity**
Day 0 Whole day	Students arrive - Hostel allotment. (Preferably do pre-allotment)
Day 1 *09:00am-03:00pm*	*Academic registration*
04:30 pm -06:00pm	Orientation
Day 2 09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 03:30 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

AftertwodaysisthestartoftheRegularPhaseofinduction.Withthisphasetherewould be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periodswithintheInductionProgram.Wefirstshowatypicaldailytimetable.

	Sessn. Time	***Activity***	***Remarks***
	Day 3 onwards		
	06:00am	Wake up call	
I	06:30 am -07:10am	Physical activity (mild exercise/yoga)	
	07:15am-08:55am	***Bath, Breakfast, etc.***	
II	09:00 am -10:55am	Creative Arts /Universal Human Value	Half the groups do Creative Arts
III	11:00 am -12:55pm	Universal Human Values /Creative Arts	Complementary alternate
	01:00pm-02:25pm	***Lunch***	
IV	02:30 pm - 03:55 pm	Afternoon Session	See below.
V	04:00 pm - 05:00 pm	Afternoon Session	See below.
	05:00 pm - 05:25 pm	***Break / light tea***	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	*Rest and Dinner*	

VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities(Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. ProficiencyModules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	***Session***	***Remarks***
Familiarization with Dept./Branch & Innovations	**IV**	For 3 days (Day 3 to 5)
Visits to Local Area	**IV, V and VI**	For 3 days - interspersed (e.g. 3 Saturdays)
Lectures by Eminent People	**IV**	As scheduled - 3-5 lectures
Literary (Play/Book Reading / Lecture)	**IV**	For 3-5days
ProficiencyModules	**V**	Daily, but only for those who need it

3.3 Closing Phase

Time	***Activity***
Last But One Day	
08:30 am -12noon	Discussions and finalization of presentation within each group
02:00 am -05:00pm	Presentation by each group in front of4other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

Aquestioncomesupastowhatwouldbethefollowupprogramaftertheformal3-week Induction Program is over? The groups which are formed should function as mentor- mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a *student guide, and* forevery20 students, there would be a *faculty mentor*.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers

from the same department/discipline[4].

Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow-up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters. It is suggested that at the start of the subsequent semesters (up to fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective artwork, and group discussions be conducted. Subsequently, the groups should meet atleast once a month.

4. Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards one self, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to linkup with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta- skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The *Induction Program* is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The *Universal Human Values* component, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and nature, and character to follow through. It also makes them reflect on their relationship with their families and extended family in the college (with hostel staff and others). It also connects students with each other and with teachers so that they can share any difficulty they might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautama Biswas, IIT Guwahati, Timothy Gonzales, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

Contact:

Prof. Rajeev Sangal, Director, IIT(BHU), Varanasi (director@iitbhu.ac.in)

[4]We are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept.