

Course Curriculum
(Course Structure and Syllabi)
for
Bachelor Programmes
(B.Tech./Dual Degree)
First Year



राष्ट्रीय प्रौद्योगिकी संस्थान हमीरपुर

हमीरपुर – 177 005 (भारत)

National Institute of Technology Hamirpur

Hamirpur – 177 005 (India) <http://www.nith.ac.in>

Preface

Located in Hamirpur district of Himachal Pradesh, NIT Hamirpur enjoys a really scenic environment and pleasant weather. The Institute was established in the year 1986, as REC Hamirpur, converted as NIT Hamirpur in 2002 and declared as the Institute of National Importance in 2007. The Institute awards Bachelor, Master and Doctoral degrees in Engineering, Sciences, Humanities & Social Sciences, Architecture and Management; fostering the spirit of national integration amongst the students, a close interaction with industry and a strong emphasis on research. At present, the Institute offers four years B.Tech. degree in Civil Engineering, Computer Science & Engineering, Electrical Engineering, Electronics & Communication Engineering, Mechanical Engineering, Chemical Engineering, Material Science & Engineering, Mathematics and Computing, Engineering Physics and a five years B.Arch. degree. The Institute has also introduced five years Dual Degree leading to Bachelor and Master of Technology in Computer Science & Engineering and Electronics & Communication Engineering. The Institute also offers M.Tech./M.Arch./M.Sc./MBA programmes with various specializations.

The Bachelor programmes of NIT Hamirpur are governed by the Ordinances for Bachelor Programmes which is available on the Institute website for the information of students and other stakeholders. First year students are advised to get fully familiar with the academic system of the Institute and provisions contained in these Ordinances. These provisions govern the policies and procedures on the admission of students, registration for courses, imparting instructions of courses, conducting examinations, evaluation, award of degree based upon performance of the students, etc. Further, students are advised to read few important points mentioned in the Ordinances like change of branch, evaluation and grading system of the Institute, minimum attendance requirement, etc. Moreover, NIT Hamirpur believes that duty, decorum and discipline are the trademarks of a good student, therefore, students are advised to read conduct and discipline rules in the Ordinances carefully and conduct themselves within and outside the precincts of the Institute in a manner befitting the students of an Institute of National Importance.

Students are also advised to go through the Academic Calendar available on the Institute website. The Academic Calendar mentions of the dates of all the important events, such as Admission, Registration, Commencement & End of the Classes, Examinations & Evaluation, Submissions of Grades, Mid-semester/Summer/Winter Breaks, etc., during the Academic Session of the Institute.

A number of Stipends, Scholarships, Endowment Scholarships/Fellowships, etc. are also awarded to the Bachelor students according to the rules and procedures laid down by the awarding agencies and/or Institute from time to time. Further, to promote and recognize academic excellence, constructive leadership and overall growth and development of students, the Senate may award a number of Prizes and Medals, established by the Institute on its own or through endowments/grants made by donors, with the approval of the Board of Governors.

It is in the interest of the student that he/she should be fully familiar with the course curriculum, academic system of the Institute and provisions contained in Bachelor Ordinances.

Director's Message

Greetings and a warm welcome to all the new entrants for joining us at National Institute of Technology Hamirpur. Congratulations for selecting National Institute of Technology Hamirpur, for your further studies and college experience. NIT Hamirpur is one of the premier autonomous Institution of National Importance in Northern India under the Act of Parliament-2007. It is a state of art Institution and a dream destination for those who wish to be leaders in Science and Technology. Besides being recognized nationally and internationally for excellent education at undergraduate level, we are also making wide strides in innovative research and other development activities. Being a National Level Institute, we have a unique group of outstanding young minds from almost all corners of the country.



Students from diverse backgrounds get to network with each other and get to identify and comprehend the wide spectrum of varied cultural and regional practices in our country. Students are not only given exposure to the latest technological advances in their chosen field but also trained to be responsible citizens of our country. The rich and unique learning environment at NIT Hamirpur develops the student physically, intellectually and emotionally. A series of activities such as cultural festival, technical festival, industry-focused seminars and extracurricular activities, open them to challenges of leadership. We not only enable our students to fulfill their dreams but also mentor them to think Big. During their tenure at the Institute, the students are given enriching and life-defining experience that enables them to reach new heights in their professional and personal lives.

The Institution has a team of highly qualified, learned and dedicated faculty with expertise in all major disciplines of engineering and technology, architecture, science and management, and is a constant source of inspiration for the students. They are actively involved in raising the standards of not only our Institute but also other institutions by collaborating with them and by sharing knowledge through faculty/student interaction programmes from time to time.

Once again, I wish all the students an outstanding, momentous and valuable stay at NIT Hamirpur and hope that you achieve your destinations/goals and emerge as top-notch engineers, technocrats, educationists or scientists.

With warm wishes

Prof. Prof. Hiralal Murlidhar Suryawanshi
Director
National Institute of Technology Hamirpur
Hamirpur (H.P.) – 177 005
Email: director@nith.ac.in



राष्ट्रीय प्रौद्योगिकी संस्थान हमीरपुर

हमीरपुर (हि.प्र.) – 177 005 (भारत)

[भारत सरकार शिक्षा मंत्रालय के तहत एक राष्ट्रीय महत्व का संस्थान]

NATIONAL INSTITUTE OF TECHNOLOGY HAMIRPUR

HAMIRPUR (H.P.) - 177 005 (INDIA)

[An Institute of National Importance under Ministry of Education (Shiksha Mantralaya)]

Institute Vision

To build a vibrant multicultural learning environment founded on value based academic principles, wherein all involved shall contribute effectively, efficiently and responsibly to the national and global community.

Institute Mission

- To achieve academic excellence in engineering, technology, architecture and science by imparting quality and value based education.
- To inspire our students to become responsible citizens and competent professionals with high ethical values.
- To meet the expectations of technical human resource at national and international level.

Objectives of Bachelor and Dual Degree Programmes

The objectives of the Bachelor/Dual Degree Programmes at the National Institute of Technology Hamirpur are as follows:

- To cultivate high standards of performance in teaching and research
- To develop the scientific, engineering and managerial manpower of the highest quality to cater to the needs of the industry, R&D organizations and academia
- To provide opportunity to students to do research in cutting edge areas
- To be a role model and leader of educational institutions in the country
- To provide a broad grasp of the fundamental principles of the scientific, technological and managerial methods through its curriculum
- To provide a deep understanding of the specific areas of specialization
- To provide an innovative ability to solve new and open problems
- To provide a capacity to learn continually and interact with multi-disciplinary groups
- To develop the students with a capability for free and objective enquiry, courage and integrity, awareness and sensitivity to the needs and aspirations of society and doing independent research in their chosen areas

With above objectives in mind, the course curriculum of Bachelor/Dual Degree Programmes is designed to include components like theory and practical course works, seminars and projects, through which a student can develop his/her concepts and intellectual skills.

Bachelor Programmes

Bachelor of Technology (B.Tech.): 4 Years (8 Semesters)

Branch

Chemical Engineering
Civil Engineering
Computer Science & Engineering
Electrical Engineering
Electronics & Communication Engineering
Materials Science & Engineering
Mechanical Engineering
Mathematics and Computing
Engineering Physics

Department

Chemical Engineering
Civil Engineering
Computer Science & Engineering
Electrical Engineering
Electronics & Communication Engineering
Material Science & Engineering
Mechanical Engineering
Mathematics & Scientific Computing
Physics & Photonics Science

Dual Degree Programmes

Dual Degree (B.Tech. & M.Tech.): 5 Years (10 Semesters)

Branch

Computer Science & Engineering
Electronics & Communication Engineering

Department

Computer Science & Engineering
Electronics & Communication Engineering

First Year Teaching Scheme w.e.f. AY 2023-24 as per NEP-2020

1st Semester						2nd Semester					
SN	Code	Subject	L	P	Credits	SN	Code	Subject	L	P	Credits
1	MA-111	Linear Algebra & Calculus	3	0	3	1	MA-121	Differential Equations	3	0	3
2	PH-101	Engineering Physics	3	0	3	2	CY-101	Engineering Chemistry	3	0	3
3	CS-111	Introduction to Computer and C Programming	2	2	3	3	CS-121	Introduction to Python and Data Structures	2	2	3
4	ME-101	Basics of Mechanical Engineering	3	0	3	4	EE-101	Basic Electrical Engineering	2	0	2
5	HS-101	Communication Skills	2	0	2	5	EC-101	Basic Electronics Engineering	2	0	2
6	HS-103	Human Values and Ethical Mindfulness	2	0	2	6	EN-101	Energy Environment & Life Science	2	0	2
7	PH-102	Physics Lab	0	2	1	7	MB-101	Entrepreneurship & Marketing Dynamics	1	0	1
8	HS-102	Communication Skills Lab	0	2	1	8	CY-102	Engineering Chemistry Lab	0	2	1
9	ME-102	Engineering Workshop Practice	1	2	2	9	EE-102	Electrical & Electronics Engineering Lab	0	2	1
						10	CE-101	Engineering Graphics	1	2	2
		Total Credits			20			Total Credits			20

HS-103 Human Values and Ethical Mindfulness shall be offered by DoHSS in both Hindi and English languages.

EE-102 Basic Electrical & Electronics Engineering Lab shall be offered jointly by DoEE and DoECE.

NOTE: Semester 1 and Semester 2 courses will run together. Out of the total admitted students in 1st year, approximately half of the students(except for MA and CS courses) strength will register for courses listed in 1st Semester and the remaining students will register for the courses listed in 2nd Semester. After one Semester they will SWAP the courses of 1st and 2nd semester.

Course Name: Linear Algebra & Calculus		
Course Code: MA-111		
Course Type: Institute Core		
Contact Hours/Week: 3L		Course Credits: 03
Course Objectives		
<ul style="list-style-type: none"> • To understand concepts of matrix algebra and its applicability in different engineering fields. • To understand the meaning of the derivative in terms of a rate of change and should be able to use derivatives to solve a variety of problems. • To able to model a written description of a physical situation with a function, a differential equation, or an integral. • To have the idea of vector calculus, fundamental theorems & its physical interpretation and applications. • To develop an appreciation of calculus as a coherent body of knowledge and as a human accomplishment. • To able to communicate mathematics both orally and in well- written sentences and should be able to explain solutions to problems. 		
Unit Number	Course Content	Contact Hours
Unit-01	Introduction to Linear Algebra: Matrices, Equivalent Matrix, Elementary Matrix, Normal form of a matrix, Gauss-Jordan reduction and inverse of matrices, Row-reduced matrix, Linear dependence and independence of vectors, Rank of a matrix, Consistency and Solution of linear system of equations,	05L
Unit-02	Eigenvalues and Eigenvectors: Characteristic equation, Eigen-values, Eigen vectors, Properties of Eigen-values, Orthogonal vectors and its properties, Cayley-Hamilton theorem and its applications.	03L
Unit-03	Differential Calculus: Function of two variables, Limit, Continuity and Differentiability, Partial Differentiation and its geometrical interpretation, Homogeneous functions, Euler's theorem and its extension, Total differentials, Composite function, Jacobian, Taylor's and Maclaurin's series (for one and two variables), Maxima and minima of functions of two variables, Method of undetermined multipliers, Curve tracing.	08L
Unit-04	Integral Calculus: Double Integrals (Cartesian and Polar), Change of Order of Integration, Change of Variables, Applications of Double Integrals, Triple integrals, Change of variables, Applications of Triple Integrals.	08L
Unit-05	Vector Calculus (Differential): Point functions, Differentiation of vectors, General rule of differentiation, Space curves (curves in space), Tangent, Principal normal, Binormal, Osculating plane, Normal plane, Rectifying plane, Curvature and Torsion, Radius of curvature, Frenet's formulae, Tangential and Normal Acceleration, Relative Velocity and Acceleration. Gradient, Divergence and Curl and their Physical Interpretation, Directional derivative, Del applied twice to point function, Del applied to products of point functions.	08L
Unit-06	Vector Calculus (Integral): Line Integral, Surface Integral, Volume integrals, Theorems of Green, Stokes and Gauss (without proofs) and their verifications and applications, Irrotational fields, Solenoidal fields	04L
Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1: Understand and analyze the theoretical & practical aspects of matrices and calculus.		
CO2: Solve systems of linear equations using multiple methods, demonstrate understanding of linear independence, and determine eigenvalues and eigenvectors and solve eigenvalue problems.		
CO3: Understand the various solution techniques and practical aspects of differential and Integral calculus.		
CO4: Familiar understanding with the basic concepts of differential geometry and the application of vector differentiation and integration to solve the real time surface, area and volume problems.		
CO5: Apply the concepts of matrices and calculus in various engineering problems.		
Text Books:		
1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, NC, New York.		
2. R.K. Jain and S.R.K. Iyenger, Advanced Engineering Mathematics, Narosa Pub. House.		
3. B.V. Ramana, Higher Engineering Mathematics, Mc Graw Hill, India.		
Reference Books:		
1. G.B. Thomas, M.D. Weir, J. Hass, Thomas' Calculus, Pearson Education India.		
2. Gilbert Strang, Calculus, Wellesley-Cambridge Press.		
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.		

Course Name:	Engineering Physics	
Course Code:	PH-101	
Course Type:	Institute Core	
Contact Hours/Week:	3	Course Credits: 3
Course Objectives		
<ul style="list-style-type: none"> To create an ability to understand laser system, optical fibre in industries, laboratories and in communication To understand concepts of communication through electrodymanics. The broad education necessary to understand behavior of semiconductor devices. Acknowledge of concepts / technologies like superconductivity. 		
Unit Number	Course Content	Contact Hours
UNIT-01	Electrostatics and Electrodynamics: Gauss's Law in dielectric medium, Equation of continuity, displacement current, Maxwell's equations, wave equation for electromagnetic radiation, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting theorem & Poynting vector.	06L
UNIT-02	Laser Physics: Concepts of laser, spontaneous and stimulated emission, elementary idea about Lasers, basic principles involves in laser, three and four level laser system, coherence, characteristics of laser light; ruby, He-Ne, CO ₂ and semiconductor lasers, application of lasers.	06L
UNIT-03	Fibers Optics and Photonics: Optical Fiber, physical structure and basic theory, modes in optical fibers, step index and graded index fibers, losses in optical fibers, sources and sensors for optical fibers, applications of optical fibers in communication.	06L
UNIT-04	Quantum Mechanics: Need of quantum mechanics, Compton effect, Born's concept of wave function, Eigen function and Eigen values, operators in quantum mechanics, expectation values, time independent, time dependent Schrodinger's wave equations and its applications viz., particle in one dimensional potential well.	06L
UNIT-05	Introduction to Solids: Free electron theory (Classical & Quantum): Assumptions, Merits and drawbacks, Fermi level, Density of states, Periodic potential, Bloch's theorem, Kronig–Penny modal, E–K diagram, Effective mass, Origin of energy bands in solids, Classification of materials : Metals, semiconductors and insulators.	06L
UNIT-06	Superconductivity: Introduction and discovery of superconductivity, superconducting materials, Meissner effect, critical magnetic field and critical current, type-1 and type-2 superconductors, isotope effect, theory of superconductivity.	06L
Course Outcomes		
Upon successful completion of the course, the students will be able to		
CO1: Describe the optical devices and their applications.		
CO2: Identify the applications of electrodymanics using Maxwell equations.		
CO3: Apply concept of semiconductor physics to understand electronic systems.		
CO4: Apply concepts of Quantum mechanics in solving physics problems at nanoscale.		
CO5: Learn the working of equipment based on physical phenomenon.		
Text Books:		
1. M. N. Avadhanulu and P. G. Kshirsagar, A Textbook of Engineering Physics by S. Chand.		
2. P. S. Aithal and H. J. Ravindra, Textbook of Engineering Physics by Acme Learning Pvt. Ltd., New Delhi.		
3. Kittle C, State Physics by John Wiley & Sons, 2005.		
References Books:		
A. K. Ghatak and K. Thyagarajan, Lasers Fundamentals and Applications by Springer, 2010.		
B. G. Streetman, Solid State Electronic Devices by Prentice Hall of India, New Delhi 2006.		
A.S. Vasudeva, Modern Engineering Physics by S. Chand & Co. Ltd.		
D.J. Griffiths, Introduction to Electrodynamics by Pearson Education Pvt. Ltd., New Delhi, 2002		
A. Ghatak and S. Lokanathan, Quantum Mechanics by Mc Millan India Ltd.		

Course Name: Introduction to Computer and C Programming		
Course Code: CS-111		
Course Type: Institute Core		
Contact Hours/Week: 2L/2P		Course Credits: 03
Course Objectives		
<ul style="list-style-type: none"> • To introduce the concept of computer fundamentals and computer programming. • To enable the student to design algorithms. • The enable the students to understand the “C” language and its application in problem-solving. 		
Unit Number	Course Content	Contact Hours
UNIT-01	Programming Fundamentals: Introduction to computer, block diagram and organization of computer, number system and binary arithmetic, processing data, hardware, software, firmware,	05L
UNIT-02	Types of programming language: Machine language, Assembly level language, higher level language, source file, object file, translators-assembler, compiler, interpreter. Evolution and classification of programming languages.	05L
UNIT-03	Programming Techniques: Steps in program development, algorithm, flowchart, pseudo-code.	06L
UNIT-04	C Language: ‘C’ character set, literals, keywords, identifiers, data types and size, variable declaration, expression, labels, statements, formatted input output statements, types of operators, data type conversion, mixed mode arithmetic, control structures.	08L
UNIT-05	Control Statement and Derived Datatypes: Control Statement and Expressions, Looping, Arrays and String, Pointers, Structures, Union.	05L
UNIT-06	Functions and File Handling: ‘C’ functions, library functions, parameter passing, recursion, ‘C’ files, function for file handling, ‘C’ pre-processors and command line arguments, macros and conditional compiler directives.	08L
Course Outcomes		
Upon successful completion of the course, the students will be able to		
CO1: Know the basic components of the computer and the working of each device.		
CO2: Design algorithms and flowcharts		
CO3: Understand the fundamentals of C programming.		
CO4: Use suitable data structure for problem-solving		
Text Books:		
1. Brian W. Kenigham and Dennis Ritchie, C Programming Language, Prentice Hall of India.		
2. Byron Gottfried, Programming with C, Tata McGraw Hill.		
3. Herbert Schildt, The Complete Reference C, Tata McGraw Hill.		
Reference Books:		
1. Yashwant Kanetkar, Let us C, BPB Publication.		
2. A. Forouzan and R.F. Gilberg, A Structured Programming Approach in C, Cengage Learning.		
3. S.K.Srivastava and Deepali Srivastava, C In Depth, BPB Publications.		

Course Name:	Basics of Mechanical Engineering	
Course Code:	ME-101	
Course Type:	Institute Core	
Contact Hours/Week:	3L	Course Credits: 3
Course Objectives		
<ul style="list-style-type: none"> ● Gain fundamental knowledge of Thermodynamics, and I.C. Engines. ● Gain knowledge of steam formation and properties of steam. ● Develop skills for material selection for different devices/ components. ● Develop know how about SFD and BMD. ● Develop knowledge to solve simple problems on stress strain. 		
Unit Number	Course Content	Contact Hours
UNIT-01	Thermodynamics: Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Zeroth law and First law, Second Law, Heat engine, Classification of heat engines, Steam formation, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of steam tables, steam calorimeters.	07L
UNIT-02	Analysis of thermodynamic cycles: Efficiency of Carnot, Otto, Diesel cycle, Concept of heat addition, heat rejection, work and efficiency. Classification of IC Engines, Efficiencies of IC Engines, CRDI, MPFI, Concept of hybrid engines.	07L
UNIT-03	Engineering Materials: Types, properties of engineering materials, Use of materials under different environmental conditions, applications of Ferrous & Nonferrous metals, Ceramics, Polymers and alloys.	06L
UNIT-04	Manufacturing Process: Basic description of the manufacturing processes – Sand Casting, Forging, Rolling, Extrusion and their applications. Types of Metal Joining Processes, Arc Welding, Soldering, Brazing and their applications, Machine tools and basic machining operations such as Turning, Drilling, Milling and Grinding. Basics of CAD/CAM, Rapid and Additive manufacturing.	07L
UNIT-05	Force and Structure Analysis: Force and Equilibrium, Centre of Gravity-simple cases, Beams, SFD & BMD of cantilever and simply supported beams, Trusses-simple cases.	07L
UNIT-06	Stress and Strain: Fundamentals of Stress and strain, Thermal Strain and Stress, Poisson Ratio, Elastic Constants, Bending of Beams, Bending equation, Torsion equation, Torsion of Springs & shafts.	08L
Course Outcomes		
Upon successful completion of the course, the students will be able to		
CO1: To understand the basic concepts of thermodynamics and heat transfer system		
CO2: To understand the principles of IC- engines		
CO3: To understand the use of materials for various applications		
CO4: To understand the function of machine tools and machining processes		
CO5: To Understand the basic concepts force, SFD and BMD		
CO6: To understand the stress and strain, concept of bending and torsion		
Books and References		
1. J. Benjamin, Basic Mechanical Engineering, Pentex Books, 9th Edition, 2018.		
2. R. K. Singal, M. Singal, and R. Singal, Basics of Mechanical Engineering, 2007.		
3. G. S. Sawhney, Fundamentals of Mechanical Engineering, PHI.		
4. P. K. Nag, Engineering Thermodynamics, 2018.		
5. B. K. Agrawal, Introduction to Engineering Materials, McGraw Hill Publication, 2008.		
6. S. Kalpakjian and S. R. Schmid, Manufacturing Processes & Engg Materials, 2022.		

Course Name	: Communication Skills
Course Code	: HS-101
Course Type	: Institute Core
Contact Hours/Week:	2L
Course Credits: 02	
Course Objectives	
<ul style="list-style-type: none"> To introduce the basic skills crucial for successful English language communication. To enable learners to develop a strong theoretical base for participating in and handling communicative tasks in English. To enable the students to communicate their perspectives in clear and correctly articulated language through LSRW skills. To provide ample opportunities to acquire, practice, and produce the language skills required in real-life academic and professional communication. To instill a lifelong habit of language learning among students to make them self-sufficient and independent learners. 	
Unit Number	Course Content
UNIT-01	<p>Introduction: Role of Effective Communication Skills for an Engineer, Challenges in Learning Language and Means to overcome them.</p> <p>Communication Process: What is communication? Process of Communication, Types of Communication (formal, semi-formal, and informal), Modes of Communication (verbal and non-verbal), Non-verbal Communication Types (Kinesics, Proxemics, Chronemics), Channels and Levels of Communication (Extrapersonal, Interpersonal, Intrapersonal, Organizational, and Mass), Barriers to Effective Communication</p>
UNIT-02	<p>Effective Listening Skills: What does listening mean? Listening versus Hearing, Listening Process (hearing, understanding, remembering, evaluating, and responding), Types of Listening (appreciative, empathetic, comprehensive, critical, and superficial), Note-taking, Barriers to Listening, Strategies for Effective Listening</p> <p>Effective Speaking Skills: Interviews: Video conferencing (Google Meet, Zoom or Microsoft Teams) and Personal Interviews, Pre-interview Planning, preparing for GD in Current Topics, Strategies for Answering Interview Questions (most frequent questions and behavioral questions using STAR method)</p> <p>Public Speaking: Presenting a Variety of Speeches (informative, persuasive, demonstrative and special occasion), Extempore versus Impromptu Speech, Speech Preparation and Presentation Techniques Improving Non-verbal Cues (voice, diction, and other mechanics of speech)</p> <p>SWOT Analysis: Personal and organizational</p>
UNIT-03	<p>Reading Skills: Referencing Skills: Use of traditional versus Digital Dictionaries, Note-making, Methods of Note-making (sentence, outline, mind-map, tabular/charting and Cornell)</p> <p>Comprehension Skills: Reading for Local and Global Understanding, Reading between the Lines, Summarizing the Ideas from the Reading Comprehension Passages, Reading for Evaluation, Vocabulary in Context</p> <p>Reading for literary appreciation: Reading fiction/poetry/plays and learning language through literature</p>
UNIT-04	<p>Writing Skills: Paragraph Writing: Format (introduction, topic sentence, supporting details and conclusion), Genres of Writing (descriptive, narrative, expository and persuasive), Stages of Writing (brainstorming, drafting, revision, editing, proofreading and formatting)</p> <p>Letter and Email Writing: Formal versus Informal letters/emails, Letters Formats (full block, semi-block, modified block and modified semi-block), Request and permission letters and emails</p> <p>Statement of Purpose (SoP): Importance of SoP, Format, and Guidelines for Writing SoP</p> <p>Cover letter and resume: Types of Resume (chronological and functional), Latest Professional Resume Templates</p> <p>Report Writing: Importance of technical report writing, types of technical reports, Language of report writing, collection of data for report writing, interpreting results (Charts and Figures), Outline of a technical report, writing abstracts/reports.</p>
Course Outcomes	
<p>Upon successful completion of the course, the students will be able to</p> <p>CO1: Identify the importance of communication skills and develop their understanding of the basic concepts related to English language skills.</p> <p>CO2: Understand and analyze critically what they listen/read and respond appropriately and constructively.</p> <p>CO3: Apply principles of effective LSRW skills in professional and social communication.</p> <p>CO4: Understand, analyze and evaluate the verbal and non-verbal messages effectively</p> <p>CO5: Acquire learning strategies to improve their communication skills after the course completion.</p>	
Textbooks	
<ol style="list-style-type: none"> Technical Communication: Principles and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press: New Delhi. English for Jobseekers: Language and soft skills for the aspiring by Lina Mukhopadhyay, Cambridge University Press: India. Practical English Usage by Michael Swan. Oxford University Press: Oxford. 	
Reference Books	
<ol style="list-style-type: none"> Strengthen your Communication Skills by Salivendra Jayaraju. Maruthu Publications: India. The Definitive Book of Body Language by Allan Pease and Barbara Pease. Manjul Publishing House: New Delhi. Language Through Literature: An Introduction. Paul Simpson. United Kingdom, Routledge. 	

Course Name: Human Values and Ethical Mindfulness		
Course Code: HS-103		
Course Type: Institute Core		
Contact Hours/Week: 2L		Course Credits: 02
Course Objectives		
<ul style="list-style-type: none"> To impart knowledge about fundamental aspects related to Ethics. To develop an understanding of the major Ethical theories that guide Human Values Principles. To understand and be able to articulate the role of Ethics in Community Well-being. To practice and apply the practical information gained in the course to Personal Ethical Lifestyle Choices. 		
Unit Number	Course Content	Contact Hours
UNIT-01	Introduction to Ethics: Definition of Ethics, Personal Ethics, Professional Ethics, Difference between Ethics, Values, and Morals. Ethics and Human Interface: Essence, Determinants and Consequences of Ethics in - Human Actions; Dimensions of Ethics; Types of Ethics; Ethics - in Private and Public Relationships. Human Values- Lessons from the Lives and Teachings of Great Reformers and Behaviourists; Role of Family Society and Educational Institutions in Inculcating Values.	05L
UNIT-02	Theories of Ethics: Normative theories, Psychological Egoism, Utilitarianism, Kant's Social Contract theory, Stakeholder theory, Stockholder theory, Gandhi's Trusteeship theory; Forsyth's Taxonomy of Ethical Ideologies; Kohlberg's Model of Cognitive Moral Development; Piaget theory of moral development, Need for developing an Industry-wide Code of Ethics: Inclusive and Accountable Industry, Transparent Standards, Fair competition, Equal Opportunity Employer, Health Safety and Environment, Conflict of Interest.	08L
UNIT-03	Ethics & Emotional Intelligence: Emotional Intelligence: Concepts, and their Utilities and Application in Administration and Industry. Ethics, Metacognition & Mindfulness. Ethics, Corporate social responsibility & Consumer protection; Environmental ethics: Role of Industry in Environmental Management, India's Environmental Policies, ISO 14000 family; Behavioural ethical issues in areas like Discrimination, Privacy, Recruitment & Selection, Electronic surveillance, Health & Safety, Performance appraisals. Role of Human relation approach in Ethical Industry and Life Skills.	05L
UNIT-04	Ethical Decision Making & Mindfulness: Attitude: Content, Structure, Function; its Influence and Relation with Thought and Behaviour; Attribution theory; Ethics and Attitudes; Social Influence and Persuasion. Ethical Decision-making Virtue and common Good approach; Influence of Ethical Decision Making: Personal Values and Ethical Decision making, Trustworthiness, Respect, Responsibility, Fairness, Integrity, Caring, Citizenship and Fundamental Duties and Directive Principles in India. Assignment & Case Studies	08L
Course Outcomes		
Upon successful completion of the course, the students will be able to		
CO1: Students will be able to understand the importance of ethics in behaviour.		
CO2: Students will be able to expand their understanding of ethics, and articulate key philosophical arguments with Mindfulness in the field of ethics.		
CO3: Students will be able to construct a multi-perspective analysis of human values and ethics.		
Text Books		
1. Professional Ethics by R. Subramanian Oxford University Press.		
2. Introduction to Psychology, 7th Edition by Morgan, King, Weisz, and Schopler, McGraw Hill Education.		
3. Positive Psychology: The Science of Happiness and Human Strength by Carr. UK: Routledge.		
Reference Books		
1. Engineering Ethics, Concepts Cases by Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e, Cengage learning.		
2. Business Ethics Concepts & Cases by Manuel G Velasquez, 6e, PHI.		
3. Ethics in Engineering Practices & Research by Caroline Whitbeck. Cambridge University Press.		

मानविकी और सामाजिक विज्ञान विभाग

कोर्स का नाम : मानवीय मूल्य और नैतिक सचेतन कोर्स कोड : एचएस-103 कोर्स का प्रकार: Core / कोर		
संपर्क घंटे/सप्ताह: 2L		कोर्स क्रेडिट: 02
पाठ्यक्रम के उद्देश्य <ul style="list-style-type: none"> • नैतिकता से संबंधित मूलभूत पहलुओं के बारे में ज्ञान प्रदान करना। • मानव मूल्यों के सिद्धांतों का मार्गदर्शन करने वाले प्रमुख नैतिक सिद्धांतों की समझ विकसित करना। • सामुदायिक कल्याण में नैतिकता की भूमिका को समझने और स्पष्ट करने में सक्षम होना। • व्यक्तिगत नैतिक जीवन शैली विकल्पों के लिए पाठ्यक्रम में प्राप्त व्यावहारिक जानकारी का अभ्यास करना और उसे लागू करना। 		
खंड संख्या	पाठ्यक्रम सामग्री	सामग्री समय
यूनिट-1	नैतिकता का परिचय नैतिकता की परिभाषा, व्यक्तिगत व व्यावसायिक नैतिकता, नैतिकता, मूल्यों और नैतिकता के बीच अंतर। नैतिकता और मानव इंटरफेस: मानव क्रियाओं में नैतिकता का सार, निर्धारक और परिणाम; नैतिकता के आयाम; नैतिकता के प्रकार; नैतिकता - निजी और सार्वजनिक संबंधों में। मानवीय मूल्य - महान सुधारकों और व्यवहारवादियों के जीवन और शिक्षाओं से सबक; मानव के विचारों में मूल्यों को स्थापित करने में परिवार, समाज और शैक्षिक संस्थानों की भूमिका।	5 लेक्चर
यूनिट-2	नैतिकता के सिद्धांत सामान्य / नियामक सिद्धांत, मनोवैज्ञानिक अहंवाद, उपयोगितावाद, कांत का सामाजिक अनुबंध सिद्धांत, हितधारक सिद्धांत, शेयरधारक सिद्धांत, गांधी जी का विश्ववाद सिद्धांत; फोर्सिथ की नैतिक विचारधाराओं का वर्गीकरण; कोलबर्ग का संज्ञानात्मक नैतिक विकास का मॉडल; पियागेट का नैतिक विकास का सिद्धांत, एक उद्योग-व्यापी आचार संहिता विकसित करने की आवश्यकता: समावेशी और जवाबदेही उद्योग, पारदर्शी मानक, निष्पक्ष प्रतिस्पर्धा, समान अवसर नियोक्ता, स्वास्थ्य सुरक्षा और पर्यावरण, हितों का टकराव।	8 लेक्चर
यूनिट-3	नैतिकता और भावनात्मक बुद्धिमत्ता भावनात्मक बुद्धिमत्ता: अवधारणाएँ, और उनकी उपयोगिताएँ और अनुप्रयोग प्रशासन और व्यवसाय में; नैतिकता, मेटाकॉग्निशन और सचेतन (माइंडफुलनेस)। नैतिकता, कॉर्पोरेट सामाजिक जिम्मेदारी और उपभोक्ता संरक्षण; पर्यावरण नैतिकता: पर्यावरण प्रबंधन में उद्योग की भूमिका, भारत की पर्यावरण नीतियाँ, आई.एस.ओ. 14000 परिवार; व्यवहार संबंधी नैतिक मुद्दे; इन क्षेत्रों में जैसे भेदभाव, गोपनीयता, भर्ती और चयन, इलेक्ट्रॉनिक निगरानी, स्वास्थ्य और सुरक्षा, प्रदर्शन मूल्यांकन; नैतिक उद्योग और जीवन कौशल में मानव संबंध दृष्टिकोण की भूमिका।	5 लेक्चर

यूनिट-4	<p>नैतिकनिर्णयलेनाऔर सचेतन : अभिवृत्ति : सामग्री, संरचना, कार्य; इसका प्रभाव और विचार और व्यवहार के साथ संबंध; गुणारोपण के सिद्धांत; नैतिकता और दृष्टिकोण; सामाजिक प्रभाव और अनुनय। नैतिक निर्णय लेने का गुण और सामान्य अच्छा दृष्टिकोण; नैतिक निर्णय लेने का प्रभाव: व्यक्तिगत मूल्य और नैतिक निर्णय लेना, विश्वसनीयता, सम्मान, जिम्मेदारी, निष्पक्षता, अखंडता, देखभाल, नागरिकता और मौलिक कर्तव्य और नीति निर्देशक सिद्धांत। असाइनमेंट और केस स्टडीज।</p>	8 लेक्चर
<p>पाठ्यक्रमकेपरिणाम पाठ्यक्रम के सफल समापन पर, छात्र निम्न लक्ष्य प्राप्त कर सकेंगे 1OC:छात्र व्यवहारमेंनैतिकताकेमहत्वकोसमझसकेंगे CO2:छात्रनैतिकताकीअपनीसमझकाविस्तारकरनेमेंसक्षमहोंगे ,औरनैतिकताकेक्षेत्रमें सचेतन (माइंडफुलनेस)केसाथप्रमुखदार्शनिकतर्कोंकोस्पष्टकरेंगे। 3OC:छात्रमानवीयमूल्योंऔरनैतिकताकेबहु-परिप्रेक्ष्यविश्लेषणकानिर्माणकरनेमेंसक्षमहोंगे।</p>		
<p>पाठ्य पुस्तकें: 4. Professional Ethics by R. Subramanian, Oxford University Press. 5. Introduction to Psychology, 7th Edition by Morgan, King, Weisz, and Schopler, McGraw Hill Education. 6. Positive Psychology: The Science of Happiness and Human Strength by Carr. UK: Routledge.</p> <p>संदर्भित पुस्तकें : 1) Engineering Ethics, Concepts Cases by Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e, Cengage learning. 2) Business Ethics Concepts & Cases by Manuael G Velasquez, 6e, PHI. 3) Ethics in Engineering Practices & Research by Caroline Whitbeck. Cambridge University Press.</p>		

Course Name: Physics Lab	
Course Code: PH-102	
Contact Hours/Week: 02P	Course Credits: 01
Course Objectives: <ul style="list-style-type: none"> • To gain practical knowledge by applying the experimental methods to correlate with the theory. • To learn the usage of electrical and optical systems for various measurements. • Apply the analytical techniques and graphical analysis to the experimental data. • To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group. 	
List of Experiments <ol style="list-style-type: none"> 1. To determine the specific resistance of a material wire using a post office box. 2. To find the area of a rectangle (or height of an inaccessible object) using a sextant. 3. Conversion of a galvanometer into Ammeter and Voltmeter of given range. 4. To verify the inverse square law of magnetism. 5. Study the variation of magnetic field with distance along the axis of a circular coil carrying current and to find the radius of the coil. 6. To determine the refractive index of a glass/ liquid (water) using Spectrometer. 7. To determine the wavelength of light using Newton's ring apparatus. 8. To verify the inverse square law for the intensity of radiation from a source of light. 9. To determine the wavelength of the Laser light using diffraction method. 10. To find magnifying power of a telescope by linear method. 11. To measure Young's modulus by bending of beam method. 12. Study of the attenuation and propagation characteristics of an optical fiber cable. 13. Other experiments as and when made available time to time. 	
Course Outcomes: Upon successful completion of the course, the students will be able to CO1: Handle equipments and take measurements and record data techniques for the experiments. CO2: Experimentally realize the physical phenomenon/ effects. CO3: Use different systems and instruments to measuring parameters with precision. CO4: Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.	

Course Name: Communication Skills Lab Course Code: HS-102 Course Type: Institute Core	
Contact Hours/Week: 2P	Course Credits: 01
Course Objectives <ul style="list-style-type: none"> • To develop skills for listening with understanding and speaking • To develop skills of “correct” pronunciation of the English language • To enable the students to make oral and technically aided presentations 	
List of Experiments Activities based on language software Orell iTell, 2022/others <ol style="list-style-type: none"> 1. Introduction to the Speech Sounds of English, Organs of the Speech 2. Place and Manner of Articulation—Consonant sounds 3. Vowel Sounds—Monophthongs and Diphthongs 4. Syllabification 5. Word stress, strong and weak forms 6. Listening to everyday and workplace conversations 7. Listening to Talks, documentaries, and BBC News 8. Describing People, Places, Objects, etc. 9. Just a Minute (JAM) Sessions 10. Group Discussion Sessions 11. Presentation using technology—PowerPoint Presentation (MS PPT), Google Slides, etc. 12. Interview Skills for face-to-face and online modes 	
Course Outcomes Upon successful completion of the course, the students will be able to CO1: Differentiate between different varieties of English CO2: Speak coherently with improved pronunciation CO2: Make effective presentations CO3: Listen and comprehend the English language	
Textbooks <ol style="list-style-type: none"> 1. English Phonetics and Phonology: A Practical Course by Peter Roach. Cambridge University Press: Cambridge. 2. A Textbook of English Phonetics for Indian Students by T. Balasubramanian. Macmillan India Limited: India. 3. Better English Pronunciation. By J.D. O'Connor. Germany: Cambridge University Press. 	
Reference books <ol style="list-style-type: none"> 1. Ship or Sheep: An intermediate pronunciation course by Ann Baker. Cambridge University Press: Cambridge. 2. Cambridge English Pronouncing Dictionary by Daniel Jones. Cambridge University Press: Cambridge. 	

Course Name: Engineering Workshop Practice		
Course Code: ME-102		
Contact Hours/Week: 1L,2P		Course Credits: 2
Course Objectives		
<ul style="list-style-type: none"> ● To study the fundamentals and have practical exposure of basic manufacturing processes. ● To familiarize the students with basics of machining, welding, fitting, smithy, carpentry, foundry and sheet metal related operations and handling/working of equipments & processes. ● To familiarize students with various handling/working of Soldering and Brazing processes. 		
Unit Number	Course Content	Contact Hours
UNIT-01	Importance of Engineering Workshop and description about each shop. Basic brief introduction of Engineering Materials and their classification. Introduction to Smithy shop, brief introduction of tools used in Smithy.	3L
UNIT-02	Brief description of machining operations. Lathe type and specifications. Study about construction and working of Lathe machine and operations. Brief description of various joining processes. Brief description about Arc Welding and Gas Welding processes. Introduction of Soldering & Brazing processes	3L
UNIT-03	Brief description about tools used in Foundry shop and methods of preparation of green sand mould, sand type and properties. Brief description of various fitting operations such as chipping, fitting. Scraping. Drilling, reaming & thread cutting. Function and classification of various hand tools used in fitting.	3L
UNIT-04	Classification of wood, importance of seasoning. Brief introduction of Carpentry tools. Different Carpentry joints & their application. Introduction to Sheet metal shop. Acquaintance with Sheet metal tools and their uses.	3L
List of Experiments		
<ol style="list-style-type: none"> 1. Preparation of job as per given drawing using Lathe Machine covering various operations using Lathe and attachment. 2. Preparation of job as per given drawing T Joint using Arc welding Setup, Soldering & Brazing Job Practice 3. Preparation of Green Sand Mould using tools of Foundry Shop by various method. 4. Preparation of job as per drawing for cutting practice and Dovetail Joint in Carpentry Shop using Carpentry Tool. 5. Preparation of job as per given drawing related to Fitting shop, and Preparation of job in sheet metal shop for Riveting operation. 6. Preparation of job as per given drawing (Chisel) using tools of Smithy Shop. 		
Course Outcomes		
Upon successful completion of the course, the students will be able to		
CO1: Learn the basics of metal machining, fitting, forging, foundry and sheet metal related operations.		
CO2: Develop the skill for soldering and brazing operations		
CO3: Able to learn basic repair and maintenance techniques using welding processes.		
CO4: Able to learn basic carpentry processes.		
Text Books		
1. A Course in Workshop Technology by B.S. Raghuvanshi, Dhanpat Rai & Company(P) Limited.		
2. Elements of Workshop Technology by Hajra Choudhary & Nirjhar Roy, Media Promoters and Publishers Pvt. Ltd.		
3. Workshop Technology by R.S. Khurmi & J.K. Gupta, S.Chand		
Reference Books		
1. Mechanical Workshop Practice, by K. C. JOHN, PHI Learning Pvt. Ltd., 27-Aug-2010		
2. Workshop Practice, by H.S. Bawa, McGraw Hill Education; 2nd edition		
3. Manufacturing Practices (Workshop Practice), by Dr. R.K. Singal, S.K. Kataria & Sons		

Course Name: Differential Equations		
Course Code: MA-121		
Course Type: Institute Core		
Contact Hours/Week: 3L		Course Credits: 03
Course Objectives:		
<ul style="list-style-type: none"> • To introduce the fundamental concepts relevant to Ordinary & Partial Differential Equations, Transform Theory. • To able to form and solve the ordinary & partial differential equation using different analytical techniques. • To have the idea of Laplace transform and its uses in engineering problems. 		
Unit Number	Course Content	Contact Hours
Unit-01	First Order Ordinary Differential Equations: Exact Differential Equations, Equations reducible to exact equations, Non-linear Equation of First Order, Clairaut's equation.	05L
Unit-02	Higher Order Ordinary Differential Equations: Higher order linear differential equations with constant co-efficient, Complimentary functions and particular integral, Method of variation of parameters, Equations reducible to linear differential equations with constant co-efficient (Cauchy-Euler and Legendre's linear differential equations), Simultaneous linear equations with constant co-efficient.	07L
Unit-03	Ordinary Differential Equations with Laplace Transform: Laplace transform, inverse Laplace transform, and their properties, Solution of ODE and linear simultaneous differential equations using Laplace transform.	06L
Unit-04	First Order Partial Differential Equations: Introduction and formulation of Partial Differential Equations (PDE), Solution of PDE, Linear PDE of First Order (Lagrange's Linear Equation), Non-linear Equation of First Order (Standard Forms), Charpit's Method.	06L
Unit-05	Higher Order Partial Differential Equations: Homogeneous Linear Equations with Constant Coefficients, Non-homogeneous Linear Partial Differential Equations, Non-linear partial differential equation of second order (Monge's Method).	06L
Unit-06	Applications of Partial Differential Equations: Classification of second order PDEs, Method of separation of variables, Solution of one dimensional wave and heat equation, Solution of two dimensional Laplace's equation.	06L
Course Outcomes:		
Upon successful completion of the course, the student will be able to		
CO1: Understand and analysis the theoretical & practical aspects of ODE, PDE, and Laplace Transform theory.		
CO2: Identify an appropriate technique to solve the ODE, PDE.		
CO3: Learning the limitations and advantages of ODE, PDE, and Laplace transform.		
CO4: Apply the concepts of ODE, PDE, and Laplace transform in various engineering problems.		
CO5: Demonstrate the concepts through examples and applications.		
Text Books:		
1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, NC, New York.		
2. Paras Ram, Engineering Mathematics: Through Applications, CBS Publisher & Distributors Pvt. Ltd.		
3. Henner Victor, Belozerova Tatyana, Khenner Mikhail, Ordinary and Partial Differential Equations, CRC Press.		
Reference Books:		
1. S.L. Ross, Differential Equations, John Wiley & Sons, New York.		
2. Lawrence C.Evans, Partial Differential Equations, American Mathematical Society.		
3. M. D Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Company Ltd.		

Course Name: Engineering Chemistry		
Course Code: CY-101		
Course Type: Core		
Contact Hours/Week: 3L		Course Credits: 03
Course Objectives		
<ul style="list-style-type: none"> To familiarize the students about the chemistry of engineering materials and applications. To enable the students to understand about the fundamentals of characterization techniques for different materials. To introduce equilibrium states of various systems with help of phases, components etc. To develop an understanding of electrochemistry and its applications in fuel cell/batteries and controlling corrosion. To familiarize the students about green chemistry and applications. 		
Unit Number	Course Content	Contact Hours
UNIT-01	Engineering Materials: Introduction to Engineering materials-Semiconductors- conducting polymers, Cement, Liquid crystals, Composite materials, Nanomaterials	05L
UNIT-02	Characterization Techniques-I: Introduction to spectroscopy, UV-Visible spectroscopy-Absorption laws, Instrumentation, formation of absorption bands, Chromophore and auxochrome concept, application of UV-Visible spectroscopy; IR spectroscopy - Principle, selection rules, spectral features of some classes of compounds, important features of IR spectroscopy NMR spectroscopy-Principle, relaxation processes, instrumentation, shielding-deshielding effects, spin-spin coupling, coupling constant, applications of NMR	08L
UNIT-03	Characterization Techniques-II: Introduction to Thermal methods, instrumentation and applications (TGA, DTA, DSC). Introduction to microscopy techniques- instrumentation and applications (AFM and SEM).	04L
UNIT-04	Phase rule: Introduction to phase rule, one component system, two component systems, advantages and limitations.	05L
UNIT-05	Electrochemistry: General concepts of electrochemistry, concentrations cell, galvanic cell, Fuel cells-hydrogen-oxygen fuel cell, solid oxide fuel cells, Batteries-dry cell, lead storage, Nickel-cadmium, Li-ion batteries, functioning and their applications. Applications of electrochemistry in corrosion and its control: Introduction, Types of corrosion-chemical and electrochemical, Mechanisms of corrosion, factors affecting corrosion and different protection methods for corrosion control.	10L
UNIT-06	Green Chemistry: Introduction to green chemistry, Twelve Principles of green chemistry, Synthesis of biofuel, Alternative sources of energy: Photo-catalysis, Solar cells.	04L
Course Outcomes		
Upon successful completion of the course, the students will be able to:		
CO1: Understand basic concepts of engineering materials and applications in various fields		
CO2: Identify instrumental techniques for analysis of different materials		
CO3: Understand the behavior of systems with changes in variables		
CO4: Understand the electrochemistry, batteries, fuel cells, engineering problems related to corrosion and to achieve a practical solution		
CO5: Understand basic concepts of green chemistry their applications in various fields		
Text books		
1. Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Co.		
2. Engineering Chemistry by S. Vairam and S. Ramesh, Wiley.		
3. Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Co.		
Reference books		
1. Materials Science and Engineering: An Introduction Hardcover by William D. Callister, 6th Edition, John Wiley & Sons.		
2. Physical Chemistry, by Peter Atkins, Julio de Paula, James Keeler, International Edition, 2018, Oxford University Press.		

Course Name:	Introduction to Python and Data Structures	
Course Code:	CS-121	
Course Type:	Institute Core	
Contact Hours/Week:	2L/2P	Course Credits: 03
Course Objectives		
<ul style="list-style-type: none"> • It aims to provide students with an understanding of the role computation can play in solving problems. • To help students, regardless of their major, feel justifiably confident in their ability to write small programs that allow them to accomplish useful goals. 		
Unit Number	Course Content	Contact Hours
UNIT-01	Context of Software Development - Software - Learning Programming with Python, Values and Variables - Integer and String Values - Identifiers - User Input - String Formatting, Expressions and Arithmetic - Expressions - Arithmetic Examples.	08L
UNIT-02	Conditional Statements - Boolean expressions - If/Else statement - Other Conditional Expressions, Iteration – Loops, Using Functions - Introduction to Using Functions - Functions and Modules, Exceptions -try, except, else, pass, raise.	06L
UNIT-03	Using Functions -1 - Function Basics - Parameter Passing - Custom Functions vs Standard Functions – Refactoring, Writing Functions -2 - Global Variables - Making Functions Reusable - Functions as Data, Objects - Using Objects - String, File Objects.	06L
UNIT-04	- Using Lists - Building Lists - List Traversal, Tuples, Dictionaries, and Sets - Storing Aggregate Data - Enumerating the Elements of a Data Structure,	04L
UNIT-05	Class Expressions, Class Design - Composition and Inheritance, classes, objects/instances, methods, inheritance, multiple inheritances, properties, decorators.	04L
UNIT-06	Introduction to Data Structures, algorithm complexity, arrays, Linked List, Stack, Queues, Trees and Graphs (Memory Representation and a few basic operations)	07L
Course Outcomes		
CO1: Understand basic principles of computers and understand basics of binary computation.		
CO2: Understand the programming basics (operations, control structures, data types, etc.).		
CO3: Apply various data types and control structure and understand class inheritance and polymorphism.		
CO4: Understand the object-oriented program design and development and understand and begin to implement code.		
Text Books		
1. Gutttag, John. Introduction to Computation and Programming Using Python: With Application to Understanding Data Second Edition. MIT Press, 2016.		
2. Data Structures and Algorithms in Python by Roberto Tamassia.		
3. Python Crash Course: A Hands-On, Project-Based Introduction to Programming by Eric Matthes, No Starch Press.		
Reference Books		
1. Automate the Boring Stuff With Python: Practical Programming for Total Beginners by Al Sweigart, No starch Press		
2. Fluent Python: Clear, Concise, and Effective Programming by Luciano Ramalho, O'Reilly Media.		
3. Python Cookbook by David Beazley, Brian K. Jones, O'Reilly Media, Inc.		

Course Name: Basic Electrical Engineering		
Course Code: EE-101		
Course Type: Core		
Contact Hours/Week: 2L		Course Credits: 02
Course Objectives		
<ul style="list-style-type: none"> To impart knowledge about the electrical quantities and to understand the impact of electricity in a global and societal context. To introduce the fundamental concepts relevant to DC and AC circuits and network theorems. Highlight the importance of electromagnetism and transformers in transmission and distribution of electric power. To explain the working principle, construction, applications of DC machines, AC machines & measuring instruments. 		
Unit Number	Course Content	Contact Hours
UNIT-01	Introduction: Circuit elements–RLC, voltage and current sources, Fundamental Laws of Electrical Engineering, Methods of Circuits analysis, Network theorems, Generation of A.C. sinusoidal voltage and currents, average and r.m.s. values, Form factor and peak factor, phasor representation.	07L
UNIT-02	AC Circuits, Domestic Electric Wiring & Storage Batteries: Analysis of single phase series, parallel and series-parallel circuits, Active and reactive power, p.f. and volt-amperes, frequency response and Q-factor, Analysis of balanced and unbalanced three phase a.c. circuits – Concept of voltage, current and power in three phase circuits, Basics of Domestic Electric Wiring and Storage Batteries.	06L
UNIT-03	Magnetic Circuits and Electrical machines: Magnetic circuit concept, B-H curves characteristics of magnetic materials, practical magnetic circuits, magnetic circuits with D.C. and A.C. excitation, hysteresis and eddy current losses, Magnetic force, self and mutual inductances, Principle of Transformer operation, construction and equivalent circuit of transformer, Phasor diagram and tests, Fundamentals of D.C. and A.C. machines. Principles of Power generation and Industrial Power Distribution.	08L
UNIT-04	Measuring Instruments: Classification of Instruments, Introduction to galvanometer (Moving coil and moving iron), ammeter, voltmeter, wattmeter, use of shunt and multiplier.	03L
Course Outcomes		
Upon successful completion of the course, the students will be able to		
CO1: Identify and predict the behavior of any electrical and magnetic circuit.		
CO2: Formulate and solve complex AC and DC circuits.		
CO3: Realize the requirement of transformers in transmission and distribution of electric power and other applications.		
CO4: Identify the type of electrical machines used for that particular application.		
Textbooks		
1. Fundamental of Electric Circuits by Charles K Alexander and Matthew N. O. Sadiku, TMH Publication.		
2. Electrical Engineering Fundamentals by Vincent Del Toro, PHI Publication.		
3. Basic Electrical Engineering by V N Mittal & Arvind Mittal, TMH Publication.		
4. Basic Electrical Engineering by T.K. Nagsarkar & M.S. Sukhija, Oxford University Press.		
Reference Books		
1. Basic Electrical Technology by A.E. Fitzgerald, McGraw Hill Publication.		
2. Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH Publication.		
3. Electrical Technology by H. Cotton, CBS Publishers & Distributors.		

Course Name:	Basic Electronics Engineering	
Course Code:	EC-101	
Course Type:	Institute Core	
Contact Hours/Week:	2L	Course Credits: 02
Course Objectives		
<ul style="list-style-type: none"> • Introduce students to the fundamental concepts of semiconductor devices and their practical applications. • Enable students to comprehend the operation and applications of transistors. • Provide students with a basic understanding of JFETs and MOSFETs. 		
Unit Number	Course Content	Contact Hours
UNIT-01	Diode and Its Applications: PN Junction Diode- Characteristics and Analysis; Types of Diodes- Zener Diode, Photodiodes, LED, Varactor Diode, Rectifiers and Filter Circuit: Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier and their Analysis, L,C and Pi Filters; Series and Shunt Diode Clippers, Clipping at Two Independent Levels, Clamping Operation, Clamping Circuit; Practical Clamping Circuits, Basic Regulator Supply using Zener Diode.	07L
UNIT-02	Bipolar Junction Transistor: Bipolar Junction Transistors: Construction and Characteristics of BJT, Transistor Configuration: CB, CE, CC Configuration; Small Signal Low Frequency Transistor Model (<i>h</i> -Parameters), Analysis of Transistor Amplifier using <i>h</i> -parameters.	05L
UNIT-03	Transistor Biasing: Transistor Biasing and Bias Stabilization: Operating Point, Stability Factor, Analysis of Fixed Bias, Collector to Base Bias, Emitter Resistance Bias Circuit and Self Bias Circuit, Bias Compensation Techniques Transistor Switch and Transistor amplifier.	05L
UNIT-04	Field Effect Transistor: Construction and Characteristics of JFET, JFET Biasing Circuit, JFET Amplifier, MOSFET Construction and Characteristics, MOSFET amplifiers.	07L
Course Outcomes		
Upon successful completion of the course, the students will be able to		
CO1: Demonstrate a foundational understanding of the operation of various semiconductor devices.		
CO2: Explain the working principles of transistors, including different configurations used for designing analog and digital applications.		
CO3: Understand the biasing requirements and circuits used for bipolar junction transistors (BJTs) and field-effect transistors (FETs).		
CO4: Develop analytical skills to design circuits based on BJT and FET components.		
Text Books		
<ol style="list-style-type: none"> 1. Integrated Electronics by J. Millman and C.C. Halkias, McGraw Hill Education, India. 2. Electronics Devices and Circuit Theory by R. Boylestad and L. Nashelsky, Pearson India. 3. Electronic principles by L. Malvino, Tata McGraw Hill Education. 		
Reference Books		
<ol style="list-style-type: none"> 1. Microelectronic Circuits by Adel S. Sedra, Kenneth Carless Smith, Oxford University Press. 2. Schaum's Outline of Electric Devices and Circuits by Jimmie J. Cathey, McGraw Hill. 3. Electronic Devices and Circuits by Theodore F. Bogart, Pearson India. 		

Course Name: Energy, Environment and Life Science		
Course Code: EN-101		
Contact Hours/Week: 2L		Course Credits: 02
Course Objectives		
<ul style="list-style-type: none"> To acquire a basic understanding and knowledge about the environment and its allied problems. To acquire a basic understanding and knowledge of environmental policies. To understand the relationship between energy and environment. Realize the importance of ecosystem and biodiversity for maintaining ecological balance. Develop the ability to evaluate measures for the improvement and protection of environment. To develop analytical skills, critical thinking, and demonstrate problem-solving skills using scientific techniques towards solutions of current problems and prevention of future problems. 		
Unit Number	Course Content	Contact Hours
UNIT-01	Life and its Diversity: Classification and Evolution, Ecology: Organisms and Populations (Abiotic Factors, Responses to Abiotic Factors, Adaptations, Population Characteristics, Population Interactions like Mutualism Competition, Predation, Parasitism etc.); Ecosystem and its significance, Biodiversity and Conservation (Species on Earth and India, importance of Species Diversity, Loss of Biodiversity, In-situ and ex-situ conservation) ; Life processes (photosynthesis, Nutrition, Respiration, Transportation); Biology and Human Welfare (Human Health and Disease, Strategies for Enhancement in Food Production, Microbes like Algae, bacteria etc. in Human Welfare.	08L
UNIT-02	Environment and its Resources: Environmental Concerns in Global Politics, The Protection of Global Commons, Common Property Resources, India's Stand on Environmental Issues, Environmental Movements, Resource Geopolitics.	04L
UNIT-03	Environmental Issues: Air Pollution and Its Control, Water Pollution and Its Control, Solid Wastes, Agro-chemicals and their Effects, Radioactive Wastes, Greenhouse Effect and Global Warming, Ozone Depletion in the Stratosphere, Degradation by Improper Resource Utilization and Maintenance, Deforestation), Carbon footprint, International/National legal Environmental protection agencies.	04L
UNIT-04	Energy and environment: Conventional Energy sources for Power, Transportation and Heat generation, Renewable Energy resources alternatives, Carbon trading, Climate change and Sustainability concept, Technological Advances and Institutions in India for Renewable Energy programs, Energy and Environment policies	08L
Course Outcomes		
Upon successful completion of the course, the students will be able to		
CO1: Understand environmental problems arising due to developmental activities.		
CO2: Identify the natural resources and suitable methods for conservation and sustainable development.		
CO3: Realize the importance of ecosystem and biodiversity for maintaining ecological balance.		
CO4: Identify the environmental pollutants and abatement devices.		
CO5: Understand the national and international environmental issues.		
Text Books:		
<ol style="list-style-type: none"> Joseph B, Environmental Studies, 3rd Addition, McGraw Hill Education (India) Private Limited, 2018. De AK, Environmental Chemistry, 7th Addition, New Age International (P) Limited, 2010. NCERT, Environmental Science, New Delhi. 		
Reference Books:		
<ol style="list-style-type: none"> Kaushik A, Kaushik CP, Environmental Science, New Age International (P) Limited, 2011. Bharucha R, Environmental Studies, 2004. Dave D, Katewa SS, Environmental Studies, Cengage Learning India Pvt. Ltd., 2012. 		

Course Name: Entrepreneurship & Marketing Dynamics		
Course Code: MB-101		
Contact Hours/Week: 1L		Course Credits: 01
Course Objectives:		
<ul style="list-style-type: none"> • To impart knowledge about the basics of marketing practices for entrepreneurs. • Enabling the students in understanding the various insights into entrepreneurship. • Help students with diverse academic backgrounds in choosing entrepreneurship as a career option. 		
Unit Number	Course Content	Contact Hours
Unit 1	Entrepreneurship: Introduction to Entrepreneurship: Meaning and objective., the evolving concept of entrepreneurship, entrepreneurship qualities and traits, Dos & Don'ts in entrepreneurship, Functions of an entrepreneur, creativity and entrepreneurship, types of entrepreneurs, market and its types, partnership, and company.	08L
Unit 2	Marketing Dynamics Definition of marketing, marketing vs. sales, marketing strategies (STP), BCG matrix, Ansoff matrix, marketing mix, Product and its types, new product development process, product life cycle, product mix, pricing methods.	06L
Course Outcomes		
Upon successful completion of the course, the students will be able to:		
CO1: Understand the basic concepts related to entrepreneurship and the qualities of an entrepreneur.		
CO2: To acquire knowledge on entrepreneurship development and its Pro's and Con's.		
CO3: Understand the key concepts related to the types of market and how concepts of marketing are closely associated with entrepreneurship.		
Text Books:		
1. Kotler P. "Principles of Marketing", 17e, Pearson		
2. Vasant Desai, "Entrepreneurial Development: The Entrepreneur, Entrepreneurship and Development Principles, Programmes and Policies". Himalaya Publishing House.		
3. Arya Kumar, "Entrepreneurship: Creating and Leading an Entrepreneurial Organization" Pearson.		
Reference Books:		
1. Howard H. Frederick, Donald F. Kuratko, Allan O'Connor "Entrepreneurship - Theory, Process Practice", 4th edition, Cengage Learning		
2. Ian Chaston "Entrepreneurial Marketing: Sustaining Growth in All Organisations", New Edition, Palgrave Macmillan.		
3. Ries, Eric "The Lean Startup: How Constant Innovation Creates Radically Successful Businesses", Penguin UK.		

Course Name: Engineering Chemistry Lab	
Course Code: CY-102	
Contact Hours/Week: 2P	Course Credits: 01
Course Objectives:	
<ul style="list-style-type: none"> • To analyse water samples for different parameters like amount of residual chlorine, alkalinity and hardness • To measure physical properties of liquids and systems of different components • To estimate the percentage of a particular metal in its ore or alloy • To familiarize students about the characterization method like absorption spectroscopy and adsorption processes • To determine quantitative composition of a solution through conductometric and potentiometric titration 	
List of Experiments	
<ol style="list-style-type: none"> 1. Estimation of residual Chlorine in a given sample of water 2. Estimation of concentration of hydroxyl, carbonate, bicarbonate and total alkalinity in a given sample of water 3. Estimation of Hardness (Temporary and Permanent) in a given sample of water 4. Determination of quantity of Ferrous ions in a sample of water by KMnO₄ titration 5. Estimation of Cu in a given sample of brass by (i) titration and/or (ii) Atomic absorption spectroscopy method 6. Determination of Viscosity of unknown liquid by Ostwald's viscometer 7. Determination of Viscosity using Redwood viscometer. 8. Determination of surface tension of unknown liquid by drop number method. 9. Verification of the Beer-Lambert law by using Colorimetric method and its application in determination concentration of unknown solution. 10. Conductometric titration of a weak acid with strong base. 11. Conductometric titration of a weak acid with weak base. 12. Potentiometric titration of weak acid with strong base. 13. Potentiometric titration of mixture of strong and weak acid with strong base. 14. Determination of flash and fire point of a given bituminous material. 15. Determination of phase diagram of two component system 16. Adsorption study on charcoal. <p>Note: The concerned Course Coordinator will prepare the actual list of experiments/problems at the start of semester based on above generic list.</p>	
Course Outcomes	
Upon successful completion of the course, the students will be able to	
CO1: Quantify different pollutants in water samples	
CO2: Identify the unknown liquid from their surface tension and viscosity measurement.	
CO3: Analytically measure the composition	
CO4: Understand quantitative analysis of acids and bases	
CO5: Understand to describe systems of one/two component	

Course Name: Electrical and Electronics Engineering Lab

Course Code: EE-102

Contact Hours/Week: 2P

Course Credits:01

Course Objectives

- To impart basic knowledge of electrical quantities such as current, voltage, power, energy etc.
- To familiarize students with basic circuit components and their connections.
- To explain working principle of electrical measuring instruments such as ammeter, voltmeter, wattmeter, energy meter etc.
- Familiarization with electronic components and equipments.
- To validate and verify the characteristics of various electronic devices.
- To implement electronic circuits using different electronic components.

List of Experiments

1. To verify fundamental laws of Electrical Engineering
 - I. Ohm's law for Bilateral Passive Linear Lumped (BPLL) element.
 - II. KVL and KCL
2. To verify Network theorems
 - I. Norton and Thevenin Theorem
 - II. Maximum power theorem
 - III. Superposition theorem
 - IV. Tellegen's Theorem
3. To calibrate a measuring instrument
 - I. Voltmeter with the help of standard ammeter and resistance.
 - II. Ammeter with the help of standard voltmeter and resistance.
 - III. Wattmeter by direct loading.
4. To find minimum fusing current and fuse constant of a given fuse wire.
5. To check polarity markings of a transformer and to determine self & mutual inductance of windings.
6. To find voltage current relationship in R-L series circuit and to determine power factor of the circuit. Also determine the inductance of a coil using voltmeter, ammeter methods
7. Familiarization of electronic components and equipments like CRO, function generator and power supplies etc.
8. To study the V-I characteristics of p-n junction diode and determine its static and dynamic resistance.
9. To study the characteristics of Zener diode, calculate the dynamic resistance and working as Voltage regulator.
10. To study and plot the waveform of half wave and full wave rectifier with and without capacitor filter.
11. To study and plot the input and output characteristics of CE (Common Emitter) and CB (Common Base) transistor configurations and calculate their input and output resistances.
12. To study the characteristics of FET (Field Effect Transistor) and calculate its dynamic resistance (r_d), mutual conductance (g_m) and amplification factor (μ).

***NOTE:** The experiments of EE-102 course shall be jointly conducted by Electrical Engineering and Electronics & Communication Engineering Departments. However, the final grade submission of the Lab course EE-102 shall be done by Electrical Engineering Department.

Course Outcomes

Upon successful completion of the course, the students will be able to

- CO1: Verify fundamental laws like Ohm's law, KCL, KVL and use different meters and instruments for the measurement of common electrical quantities.
- CO2: Understand the importance of fuse as a safety device and study the parameters related to the selection of fuse wire.
- CO3: The basic working principle & construction of a transformer.
- CO4: Understanding of different meters and instruments for measurement of electronic quantities.
- CO5: Develop skills for designing electronics circuits and its practical implementation on breadboard.
- CO6: Understand the characteristics of different electronic devices like diodes, BJT and FET.

Course Name:	Engineering Graphics	
Course Code:	CE-101	
Course Type:	Institute Core	
Contact Hours/Week: 1L + 2P	Course Credits: 2	
Course Objectives:		
<ul style="list-style-type: none"> • To know and practice basic drafting skills • To be able to understand the designs of structures or machine parts. • To be able to visualize the projected drawings and present various projections on the sheet 		
Unit Number	Course Content	Contact Hours
UNIT-01	Introduction: Drawing instruments and their uses, Types of lines, Lettering, General rules for dimensioning, Geometrical constructions using instruments	01L
	Orthographic Projection: Methods of projection, Principles of Orthographic projection, First angle versus third angle of projection, Six views of an object	02L
	Isometric Projections: Isometric views of simple solids	01L
UNIT-02	Projection of Points: Projections of points when they are situated in different quadrants	01L
	Projections of Lines: Projections of a line parallel to one of the reference planes and inclined to the other, line inclined to both the reference planes, Traces.	02L
UNIT-03	Projections of Planes: Projections of a plane perpendicular to one of the reference planes and inclined to the other, Oblique planes	02L
	Projections of Solids: Projections of solids whose axis is parallel to one of the reference planes and inclined to the other, axis inclined to both the planes	02L
UNIT-04	Section of Solids: Sectional planes, Sectional views of prism and pyramid	01L
Course Outcomes:		
Upon successful completion of the course, the students will be able to		
CO1 Know the basic drafting tools		
CO2 Understand the designs of structures and machine parts		
CO3 Practice visualization.		
Text and Reference Books:		
Bhatt N D. and Panchal, V.M, Engineering Drawing, Charotar Publishing House		

Evaluation of Theory/Practical/Drawing/Engineering Workshop/Programming & Coding Skills/ Studio Courses

The weightages of various components for award of Grades in Theory/Practical/Drawing/Engineering Workshop/Programming & Coding Skills /Studio Courses shall be as under:

A. Evaluation of Courses offered for B Tech/Dual Degree programme

There are varieties of courses which are offered to B Tech/Dual degree programme and their weightages of various components for award of Grades shall be as under

(i) Courses Having Lectures (Theory Courses)

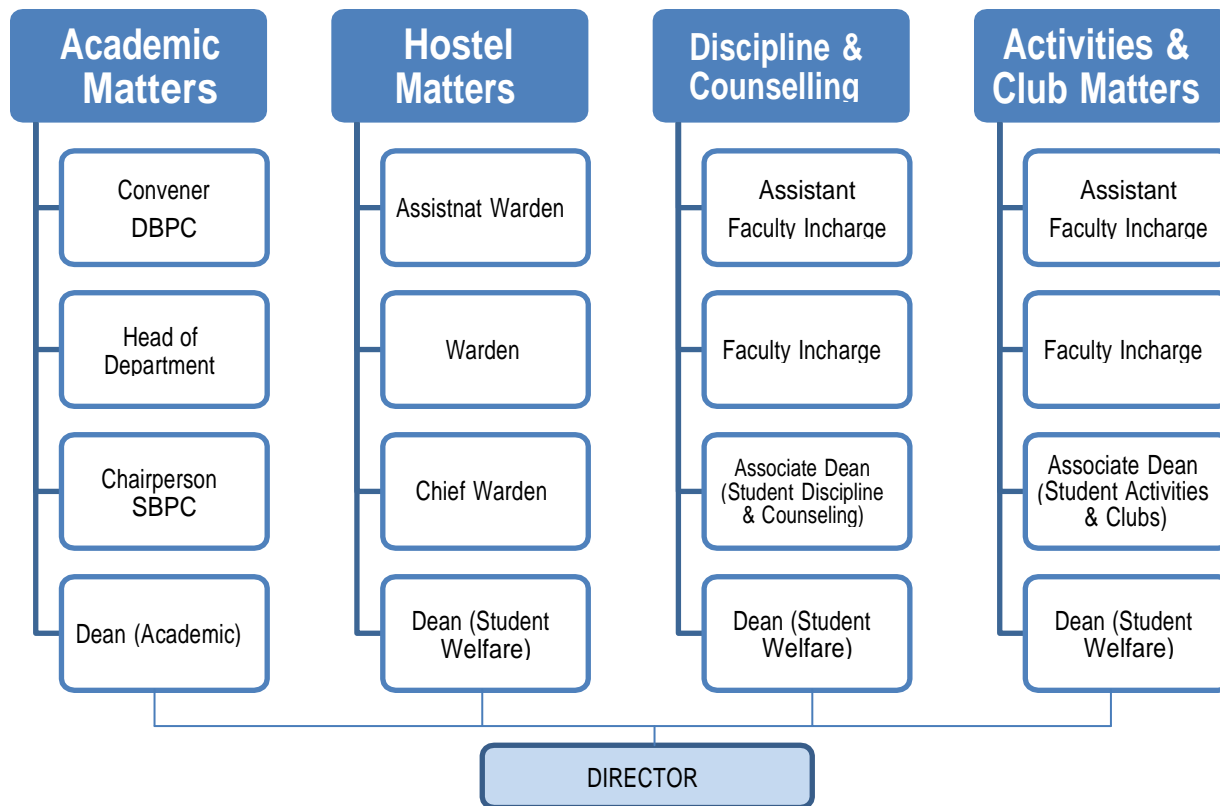
SN	Component	Weightage
1.	Continuous Semester Assessment (Based on performance in assignments/quizzes/tests/tutorials, etc.)	20%
2.	Mid Semester Examination	20% (1½ Hours)
3.	End Semester Examination	60% (03 Hours)

(ii) Courses Having Practical's

SN	Component	Weightage
1.	Continuous Semester Assessment (Based on quantity and quality of experiments/jobs, skills in handling equipment, performance in viva/tests, accuracy of outcomes/features, etc.)	60%
2.	End Semester Examination (Performance in practical/job/test/quiz/viva, etc.)	40%

(iii) Courses of Engineering Workshop/Engineering Graphics/Programming & Coding Skills

SN	Component	Weightage
Continuous Evaluation		
1.	Continuous Semester Assessment (Based on quantity and quality of experiments/jobs/drawings, skills in handling equipment, performance in viva/tests, accuracy of outcomes/features, etc.)	60%
End Semester Evaluation		
2.	Minor Practice Test (Written)	20%
3.	End Semester Examination (Based on quality of job/drawing/project/coding skills)	20%



Computer Center	Computer Centre is a central facility related to computing, communication and networking services
Central Workshop	As part of Department of Mechanical Engineering, the Central Workshop imparts practical training to students of all departments in the shop floor
Health Center	Provides treatment for different diseases and also provide first aid to the injured. Institute ambulance is available for serious cases
Central Library	Home of almost 90000+ books and journals and can accommodate more than 500 students
Auditorium	Used to organize various Institute events
Open Air Theater	Used to organize students functions
SBI Branch	Ground Floor, Estate Office Building
Post Office	First Floor, Estate Office Building (Above SBI Bank)
Eateries	Amul, Verka, Juice Bar, HPMC and 4H
Book Shops	One near Estate Office and one at Main Gate
Other Shops	Photostat and Printing Shop (Near Estate Office), Two Confectionaries Shops (one near Estate Office and one at Main Gate), One Vegetable and Fruits Shop (Main Gate), One Daily Need Shop (Main Gate), Patanjali Store (Gate II)
Laundry Shops	One near SBI Bank and one near Gate II
Student Activity Centre	Used to Organize various sports events

