Curriculum & Syllabus for B.Tech

UnderAutonomy Incorporation of NEP 2020

Information Technology

(Effective From 2023-24 Admission Batch)

Group A: CSE, CSE (AIML), CST, DS, FT, AGR, BME
Group B: ECE, EE, IT, ECS, CE, ME

Department: Information Technology

Curriculum Structure & Syllabus

		1st Year 1st Semester							
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A. THEORY									
1	ENGG	Major	IT101	Programming Skills for Problem Solving	3	0	0	3	3
2	ENGG	Minor	EE(IT)101	Basic Electrical & Electronics Engineering	3	0	0	3	3
3	SCI	Multidisciplinary	M(IT)101	Engineering Mathematics	3	0	0	3	3
4	SCI	Multidisciplinary	PH(IT)101	Engineering Physics-I	3	0	0	3	3
5	HUM	Value Added Course	HU104	Environmental Science	2	0	0	2	2
6	HUM	Value Added Course	HU105	Indian Knowledge System	1	0	0	1	1
B. PRACTICAL									
1	ENGG	Major	IT191	Programming for Problem Solving Lab	0	0	3	3	1.5
2	ENGG	Minor	EE(IT)191	Basic Electrical & Electronics Engineering Lab	0	0	3	3	1.5
3	HUM	Ability Enhancement Course	HU(IT)191	Technical Seminar Presentation	0	0	2	2	1
4	ENGG	Skill Enhancement Course	ME(IT)191	Engineering Graphics & Design Lab	0	0	3	3	1.5
5	SCI	Skill Enhancement Course	PH(IT)191	Engineering Physics-1 Lab	0	0	3	3	1.5
Total of Theory, Practical								29	22

HUM: Humanities; ENGG: Engineering; SCI: Science

1st Year 2nd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	IT201	Data Structure and Algorithm	3	0	0	3	3
2	SCI	Multidisciplinary	CH(IT)201	Engineering Chemistry	2	0	0	2	2
3	SCI	Multidisciplinary	M(IT)201	Engineering Mathematics	3	0	0	3	3
4	HUM	Ability Enhancement Course	HU201	Professional Communication	2	0	0	2	2
5	HUM	Value Added Course	HU202	Values and Ethics	2	0	0	2	2
6	HUM	Value Added Course	HU203	Constitution of India	1	0	0	1	1
B. PRACTICAL									
1	ENGG	Major	IT291	Data Structure and Algorithm Lab	0	0	3	3	1.5
2	HUM	Ability Enhancement Course	HU291	Professional Communication Lab	0	0	2	2	1
3	SCI	Skill Enhancement Course	CH(IT)291	Engineering Chemistry Lab	0	0	2	2	1
4	ENGG	Skill Enhancement Course	ME(IT)291	Workshop and Manufacturing Practices Lab	0	0	3	3	1.5
Total of Theory, Practical								23	18

2nd Year 3rd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	IT301	Computer Organization and Architecture	3	0	0	3	3
2	ENGG	Minor	IT302	Analog and Digital Electronics	3	0	0	3	3
3	ENGG	Major	IT303	Formal Language and Automata Theory	3	0	0	3	3
4	SCI	Minor	M(IT)301	Numerical Methods and Statistics	2	0	0	2	2
5	SCI	Minor	PH(IT)301	Engineering Physics-II	2	0	0	2	2
		B.PRACTICAL							
1	ENGG	Major	IT391	Computer Organization and Architecture Lab	0	0	3	3	1.5
2	ENGG	Minor	IT392	Analog and Digital Electronics Lab	0	0	3	3	1.5
3	ENGG	Minor	IT393	Python Programming Lab	0	0	3	3	1.5
4	HUM	Ability Enhancement Course	HU(IT)391	Soft Skill & Aptitude	0	0	2	2	1
5	SCI	Skill Enhancement Course	PH(IT)391	Engineering Physics-II Lab	0	0	3	3	1.5
Total of Theory, Practical								27	20

2nd Year 4th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	IT401	Object Oriented Programming Using Java	3	0	0	3	3
2	ENGG	Major	IT402	Software Engineering	3	0	0	3	3
3	ENGG	Major	IT403	Operating System	3	0	0	3	3
4	SCI	Minor	M(IT)401	Discrete Mathematics	3	0	0	3	3
5	HUM	Minor	HU401	Economics for Engineers	2	0	0	2	2
B.PRACTICAL									
1	ENGG	Major	IT491	Object Oriented Programming Using Java Lab	0	0	3	3	1.5
2	ENGG	Major	IT492	Software Engineering Lab	0	0	2	2	1.5
3	ENGG	Major	IT493	Operating System Lab	0	0	3	3	1.5
4	ENGG	Minor	IT494	R-Programming Lab	0	0	2	2	1
5	HUM	Ability Enhancement Course	HU(IT)491	Seminar and Group Discussion	0	0	2	2	1
6	ENGG	Skill enhancement course	HU(IT)495	IT Workshop Lab (SciLab / MATLAB/ C++)	0	0	2	2	1
Total of Theory, Practical								28	21

3rd Year 5th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	IT501	Database Management System	3	0	0	3	3
2	ENGG	Major	IT502	Computer Networking	3	0	0	3	3
3	ENGG	Major	IT503	Design and Analysis of Algorithm	3	0	0	3	3
4	ENGG	Major	IT504	Artificial Intelligence	3	0	0	3	3
5	ENGG	Minor	IT505	A. e-Commerce and ERP B. Mobile Application Development C. Microprocessor and Microcontroller	2	0	0	2	2
B.PRACTICAL									
1	ENGG	Major	IT591	Database Management System Lab	0	0	3	3	1.5
2	ENGG	Major	IT592	Computer Networking Lab	0	0	3	3	1.5
3	ENGG	Major	IT593	Design and Analysis of Algorithm Lab	0	0	2	2	1
4	ENGG	Major	IT594	Artificial Intelligence Lab	0	0	3	3	1.5
5	ENGG	Minor	IT595	A. E-Commerce and ERP Lab B. Mobile Application Development Lab C. Microprocessor and Microcontroller Lab	0	0	2	2	1
6	PRJ	Project	IT581	Minor Project-I	0	0	0	2	1
Total of Theory, Practical								29	21.5

3rd Year 6th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	IT601	Web Technology	2	0	0	2	2
2	ENGG	Major	IT602	Machine Learning	3	0	0	3	3
3	ENGG	Major	IT603	A. Computer Graphics and Multimedia B. Digital Image Processing C. Internet of Things	3	0	0	3	3
4	ENGG	Major	IT604	A. Data Mining & Knowledge Discovery B. Cryptography and Network Security C. Compiler Design	3	0	0	3	3
5	ENGG	Minor	IT605	A. Mobile Computing B. Virtual and Augmented Reality C. Social Network Analysis	2	0	0	2	2
B.PRACTICAL									
1	ENGG	Major	IT691	Web Technology Lab	0	0	3	3	1.5
2	ENGG	Major	IT692	Machine Learning Lab	0	0	3	3	1.5
3	ENGG	Major	IT693	A. Computer Graphics and Multimedia Lab B. Digital Image Processing Lab C. Internet of Things Lab	0	0	3	3	1.5
4		Internship	IT681	Internship	0	0	0	0	1
5	PRJ	Project	IT682	Minor Project-II	0	0	0	2	1
Total of Theory, Practical								24	19.5

4th Year 7th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	IT701	A. Cloud Computing B. Internet Technology C. Big Data Analytics D. Pattern Recognition	3	0	0	3	3
2	ENGG	Major	IT702	A. Soft Computing B. Cyber Security C. Wireless Ad hoc Network D. NoSQL Database with MongoDB	3	0	0	3	3
3	ENGG	Major	IT703	A. Advanced Database Management System B. Block Chain Technology C. Advanced Computer Architecture D. Quantum Computing	3	0	0	3	3
4	ENGG	Minor	IT704	A. Digital Forensics B. Modelling and Simulation C. Deep Learning & Neural Networks D. Real Time Systems	3	0	0	3	3
B.PRACTICAL									
1	ENGG	Major	IT791	A. Cloud Computing Lab B. Internet Technology Lab C. Big Data Analytics Lab D. Pattern Recognition Lab	0	0	3	3	1.5
2	ENGG	Major	IT792	A. Soft Computing Lab B. Cyber Security Lab C. Wireless Ad hoc Network Lab D. NoSQL Database with MongoDB Lab	0	0	3	3	1.5
3		Internship	IT781	Industrial Training / Internship	0	0	0	0	2
4	PRJ	Project	IT782	Major Project-I	0	0	0	8	4
Total of Theory, Practical								26	21

4th Year 8th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	IT801	A. Data Sciences B. Business Analytics C. Cluster and Grid Computing D. Distributed Database	3	0	0	3	3
2	ENGG	Major	IT802	A. Human Computer Interaction B. Natural Language Processing C. Distributed Computing D. Information and Coding Theory	3	0	0	3	3
3	ENGG	Minor	IT803	A. Bio-Informatics B. Embedded System C. Human Resource Management D. Computer Vision	3	0	0	3	3
4	HUM	Ability Enhancement Course	HU(IT)801	Principles of Management	2	0	0	2	2
B.PRACTICAL									
1			IT881	Grand Viva	0	0	0	0	2
2	PRJ	Project	IT882	Major Project-II	0	0	0	12	6
Total of Theory, Practical								23	19

Total Credit = 162

Department: Information Technology
SYLLABUS
1st Year 1st Semester

A. THEORY

Course Name: Programming Skills for Problem Solving
Course Code: IT101
Contact (Periods/Week): 3L/Week
Total Contact Hours: 40
Credits: 3
Prerequisites: Knowledge up to 12th standard.

Course Outcome(s):

CO1: To identify the working principle of input and output devices of Computers memorize the basic terminology used in computer programming.

CO2: To express programs in C language and use different data types for writing the programs.

CO3: To implement programs using the dynamic behaviour of memory by the use of pointers.

CO4: To explain the difference between call by value and call by address.

CO5: To write programs using basic data files and developing applications for real world problems.

CO-PO-PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	2						2	3	2	3	3
CO2	2	2	3	3	3							3	2	2	3
CO3	2	3	2	2	2							3	2	3	2
CO4	3	2	2	3	3							2	2	2	2
CO5	2	2	2	1	1						2	3	3	3	3

Course Content:

Module-1: Fundamentals of Computer **9L**

History of Computer, Generation of Computer, Classification of Computers, Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output

devices.

Number System: basic of Binary, Octal, Decimal and Hexadecimal number systems; Representation and interchanging of number in different number systems. Introduction to complements system, Representation of signed and unsigned numbers in singed magnitude singed 1's complement system and signed 2's complement system.

Arithmetic–Addition and Subtraction (using1'scomplementand2'scomplement).

Representation of Characters-ASCII Code, Basics of Compiler, Interpreter and Assembler

Problem solving – Basic concept of Algorithm. Representation of algorithm using flow chart and pseudocode, Some basic examples.

Module-2: Introduction to C Programming 5L

Overview of Procedural vs Structural language; History of C Programming Language. Variable and Data Types: The C characters identifiers and keywords, data type & sizes, variable names, declaration, statements.

Operators & Expressions: Arithmetic operators, relational operators, Logical operators, increment and decrement operators, bitwise operators, Assignment operators, conditional operators, special operators- type conversion, C expressions, precedence and associativity.

Input and Output: Standard input and output, formatted output–print f, formatted input scanf.

Module-3: Branch and Loop 5L

Branching: Concept of Statement and Blocks in C, Simple if, if -else, nested if-else and if-else ladder.Switch Case: break and continue; switch-case, concept of goto and labels

Loops - while, for, do while

Module-4: Program Structures 4L

Function: Basics of Functions, function types, function prototypes, formal and actual parameter, function calling, functions returning values, functions not returning values. Recursion and Recursive Function.

Storage Class in C: Storage Class-auto, external, static and register storage class, scope rules and life time ofvariables

C pre-processor: Pre-processing directive and macro, parameterized macro.

Module-5: Array and Pointer 7L

Arrays: One dimensional arrays, Two-dimensional arrays

Passing an array to a function Pointers: Pointers, Pointer and Array, Pointer and functions.

Strings: Character array and string, array of strings, Passing a string to a function, String related functions,Pointer and String.

Dynamic memory allocation: Malloc, calloc, realloc and free with example.

Module-6: Structures, Unions and Enum 3L

Basic of structures, arrays of structures, structures and pointers, bit fields. Basics of union and enum, difference between structure and union.

Module-7: File in C **3L**

Files handling- opening and closing a file in different mode, formatted and unformatted files, Commandline arguments, f open, f close, f get c, f put c, f print f, f scan f function.

Textbook:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Kanetkar Y.-LetusC, BPBPublication,15th Edition

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. K R Venugopal & S R Prasad – MASTERING C, TMH, 2nd Edition

Paper Name: BASICS ELECTRICAL AND ELECTRONICS ENGINEERING
Paper Code: EE (IT)101
Category: -Major (Core)
L-T-P: 3-0-0
Credit: 3
Total Lecture: 36
Prerequisites: Knowledge up to 12th standard.

CO	Statement
CO1	Apply fundamental concepts and circuit laws to solve simple DC electric circuits
CO2	To solve simple ac circuits in steady state
CO3	Impart the knowledge of Basic Electronics Devices and ICs.
CO4	Analyze the simple electronics circuits

MODULE 1: Elementary Concepts of Electric Circuits 6L

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems-Nodal Analysis, Mesh analysis with independent sources only (Steady state)

Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)

MODULE 2: Electrical machine 8L

Transformer: Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.

DC Machines: Brief idea on constructional features, classifications, working principle of both motor and generator. Simple problems on Voltage equation.

MODULE 3: Fundamentals of Semiconductor Devices: 6L

Introduction to Semiconductor: Concept of energy band diagram; Comparison among metal, insulator, semiconductor; Semiconductors-classifications and Fermi energy level; Charge neutrality and Mass-Action law in semiconductor; Current flow in semiconductor due to drift & diffusion process; Einstein relation.

MODULE 4: PN Junction Diode: 4L

Principle of operation; V-I characteristics; principle of avalanche & Zener breakdown; Junction resistances and capacitances; V-I characteristics of Zener diode.

MODULE 5: Bipolar Junction Transistors: 4L

PNP and NPN structures; Principle of operation; Current gains in CE, CB and CC

mode; input and output characteristics; Biasing & Stability Analysis-Concept of Fixed Bias, Collector to base Bias & voltage divider bias.

MODULE 6: Introduction to IC: 8L

Integrated circuit-Basic idea, classifications, advantages, disadvantages; OPAMP(IC741)-Pin configuration and equivalent circuit; Characteristics of OPAMP(IC741); Inverting & Non-Inverting Amplifier; Adder, Subtractor, Differentiator & Integrator Circuit.

Textbooks:

1. A Textbook of Electrical Technology - Volume I (Basic Electrical Engineering) & Volume II (Ac & DC Machines)-B. L Theraja & A.K. Teraja, S. Chad,23rd Edition, 1959
2. D. Chattopadhyay, P.C Rakshit, "Electronics Fundamentals and Applications", New Age International (P) Limited Publishers, Senenth Edition,2006
3. Basic Electrical & Electronics Engineering by J.B. Gupta , S.K. Kataria & Sons,2013
4. Basic Electrical and Electronics Engineering-I by Abhijit Chakrabarti and Sudip Debnath, McGraw Hill, 2015
5. M. S. Sukhija and T. K. Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press,2012.
6. DP Kothari and IJ Nagrath, "Basic Electrical & Electronics Engineering", Tata McGraw Hill,2020.

Reference Books

1. DC Kulshreshtha, "Basic Electrical Engineering",TataMcGrawHill,2010.
2. T.K. Nagsarkar, M.S. Sukhija, "Basic Electrical Engineering", Oxford Higher Education.
3. Hughes, "Electrical and Electronic Technology", Pearson Education".
4. Parker and Smith, "Problems in Electrical Engineering", CBS Publishers and Distributors.
5. Anant Agarwal, Jeffrey Lang, Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Publishers, 2005.
6. Bernard Grob, Basic Electronics, McGraw Hill.
7. Chinmoy Saha, Arindham Halder and Debarati Ganguly, Basic Electronics-Principles and Applications, Cambridge University Press, 2018.

CO-PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO 7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	3	2	1	-	-	-	-	-	-	2	2
CO2	3	3	2	1	-	-	-	-	-	-	2	2
CO3	3	2	2	1	-	-	-	-	-	-	1	2
CO4	2	3	2	1	-	-	-	-	-	-	2	1

Course Name: ENGINEERING MATHEMATICS - I
Paper Code: M(IT) 101
Contact (L: T: P): 3 : 0 : 0
Total Contact Hours: 36
Credit: 3

Prerequisites:
The students to whom this course will be offered must have the concept of (10+2) standard matrix algebra, and calculus.

Course Objectives:
The objective of this course is to familiarize the prospective engineers with techniques in matrix algebra and calculus. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes (COs):
On successful completion of the learning sessions of the course, the learner will be able to:
CO1: Recall the properties related to matrix algebra and calculus.
CO2: Determine the solutions of the problems related to matrix algebra and calculus.
CO3: Apply the appropriate mathematical tools of matrix algebra and calculus for the solutions of the problems.
CO4: Analyze different engineering problems linked with matrix algebra and calculus.

CO-PO/PSO Mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	2	3	1	2	-	-	-	-	-	-	-	1

Course Content:
Module I: Liner Algebra (11L)
Echelon form and normal (canonical) form of a matrix; Inverse and rank of a matrix; Consistency and inconsistency of system of linear equations, Solution of system of linear equations; Eigenvalues and eigenvectors; Diagonalization of matrix, Cayley-Hamilton theorem.

Module II: Single Variable Calculus (5L)

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Concept of sequence and series, Power series; Taylor's series.

Module III: Multivariable Calculus (Differentiation) (13L)

Function of several variables; Concept of limit, continuity and differentiability; Partial derivatives, Total derivative and its application; chain rules, Derivatives of implicit functions Euler's theorem on homogeneous function; Jacobian; Maxima and minima of functions of two variables.

Module IV: Multivariable Calculus (Integration) (7L)

Double Integral, Triple Integral;Change of order in multiple integrals; Line Integral, Surface Integral, Volume Integral. Change of variables in multiple integrals.

Text Books:

1. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Kreyszig, E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Reference Books:

1. Guruprasad, S. A text book of Engineering Mathematics-I, New age International Publishers.
2. Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Veerarajan, T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Bali, N.P. and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
5. Thomas, G.B. and Finney, R.L., Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
6. Apostol, M., Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern, 1980.
7. Kumaresan, S., Linear Algebra - A Geometric approach, Prentice Hall of India, 2000.
8. Poole, D., Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
9. Bronson, R., Schaum's Outline of Matrix Operations. 1988.
10. Piskunov, N., Differential and Integral Calculus, Vol. I & Vol. II, Mir Publishers, 1969.

Course Name: Engineering Physics I
Course Code: PH(IT)101
Contact: (3:0:0)
Total Contact Hours: 36
Credits: 3
Prerequisites: Knowledge of Physics up to 12^{th} standard.

Course Objectives:

The aim of courses in Physic-I is to provide adequate exposure and develop insight about the basic principles of physical sciences and its practical aspects which would help engineers to learn underlying principles of various tools and techniques they use in core engineering and related industrial applications. The course would also inculcate innovative mindsets of the students and can create awareness of the vital role played by science and engineering in the development of new technologies.

Course Outcomes (COs):

After attending the course students' should be able to

CO	Description
CO1	explain basic principles of laser, optical fiber and holography.
CO2	understand the properties of Nano material and semiconductor.
CO3	analyze different crystallographic structures according to their co-ordination number and packing factors.
CO4	analyze the structure, function and characteristics of different storage devices.
CO5	justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	--	--	--	--	--	--	--	2
CO2	3	3	2	2	--	--	--	--	--	--	--	2
CO3	3	3	2	2	--	--	--	--	--	--	--	1

CO4	3	2	2	2	--	--	--	--	--	--	--	2
CO5	3	3	3	2	2	--	--	--	--	--	--	1

Course Content:

Module 1 (12L)

Modern Optics

1.01- Laser: Concepts of various emission and absorption processes, Einstein A and B coefficients and

equations, working principle of laser, metastable state, population inversion, condition necessary for active laser action, optical resonator, illustrations of Ruby laser, He-Ne laser, Semiconductor laser, applications of laser, related numerical problems. 6L

1.02-Fibre optics-Principle and propagation of light in optical fibers (Step index, Graded index, single and multiple modes) - Numerical aperture and Acceptance angle, Basic concept of losses in optical fiber, related numerical problems. 3L

1.03-Holography-Theory of holography, viewing of holography, applications 3L

Module 2 (6L)

Solid State Physics

2.01 Crystal Structure: Structure of solids, amorphous and crystalline solids (definition and examples), lattice, basis, unit cell, Fundamental types of lattices –Bravais lattice, simple cubic, fcc and bcc lattices, Miller indices and miller planes, co-ordination number and atomic packing factor, Bragg's equation, applications, numerical problems. 3L

2.02 Semiconductor: Physics of semiconductors, electrons and holes, metal, insulator and semiconductor, intrinsic and extrinsic semiconductor, p-n junction. 3L

Module 3 (8L)

Quantum Mechanics

3.01 Quantum Theory: Inadequacy of classical physics-concept of quantization of energy, particle concept of electromagnetic wave (example: photoelectric and Compton Effect; no derivation required, origin of modified and unmodified lines), wave particle duality; phase velocity and group velocity; de Broglie hypothesis; Davisson and Germer experiment, related numerical problems. 4L

3.02 Quantum Mechanics 1: Concept of wave function, physical significance of wave function, probability interpretation; normalization of wave functions-Qualitative discussion; uncertainty principle, relevant numerical problems, Introduction of Schrödinger wave equation (only statement). 4L

Module 4 (4L)

Physics of Nanomaterials

Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Quantum size effect and Quantum confinement. Carbon allotropes. Application of nanomaterials (CNT, graphene, electronic, environment, medical).

Module 5 (6L)

Storage and display devices

Different storage and display devices-Magnetic storage materials, Hard disc (examples related to computers compared with semiconductor storage viz. Pendrive), Operation and application of CRT, CRO, Liquid crystal display (LCD), LED, OLED, Plasma display, Thin film transistor display).

Recommended Text Books for Physics I:

Text Books:

1. Refresher courses in physics (Vol. 1, Vol. 2 & Vol. 3)-C. L. Arora (S. Chand Publishers).
2. Engineering Physics (Vol. 1, Vol. 2)-S.P. Kuila (S. Chand Publishers).
3. Perspective & Concept of Modern Physics -Arthur Baiser (Publisher: MaGrawhill)
4. Principles of engineering physics – Md. N Khan and S Panigrahi (Cambridge University Press).
5. Concepts of Modern Engineering Physics-A. S. Vasudeva. (S. Chand Publishers)
6. Engineering Physics (Vol. 1, Vol. 2)-S.P. Kuila (S. Chand Publishers).
7. Physics Volume 1&2 - Haliday, Resnick & Krane, Publisher: Wiley India).
8. Engineering Physics-B. K. Pandey And S. Chaturvedi (Publisher: Cengage Learning, New Delhi).

Recommended Reference Books for Physics I:

Modern Optics:

1. A text book of Light-Brijlal & Subhramanium, (S. Chand publishers).
2. Optics-Ajay Ghatak (TMH)

Solid State Physics:

1. Solid state physics- S. O. Pillai.
2. Introduction to solid state physics-Kittel (TMH).

Quantum Mechanics:

1. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House).

2. Quantum mechanics -A.K. Ghatak and S Lokenathan

Physics of Nanomaterials

1. Introduction to Nanotechnology, B.K. Parthasarathy.
2. Introduction to Nanoscience and Nanotechnology, An Indian Adaptation-Charles P. Poole, Jr., Frank J. Owens.

Storage and display devices

1. Optics-B.D. Gupta (Books and Allied Pvt. Ltd.).
2. Solid state physics, solid state devices and electronics by C. M. Kachhava.

Course Name: ENGINEERING CHEMISTRY
Paper Code: CH (IT)101
Total Contact Hours: 24
Credit: 2
Prerequisites: 10+2

Course Name: ENGINEERING CHEMISTRY
Paper Code: CH (IT)101
Total Contact Hours: 24
Credit: 2
Prerequisites: 10+2

COURSE OBJECTIVE

- To understand the basic principles of elements, organic reactions, drug synthesis and computational chemistry
- To apply the knowledge of different engineering materials, advanced polymers, and nanomaterials to solve complex engineering problems
- To analyse and evaluate quality parameters of water and its treatment
- Apply the knowledge of free energy, energy storage device, semiconductors and corrosion to design environment friendly & sustainable devices
- Apply the knowledge of different instrumental techniques to analyse unknown engineering materials.

COURSE OUTCOME

CO1. Able to understand the basic principles of elements, organic reactions drug systhesis and and computational chemistry
CO2. Able to apply the knowledge of different engineering materials, advanced polymers, and nanomaterials to solve complex engineering problems
CO3. Able to analyse and evaluate water quality parameters and its treatment
CO4. Able to the knowledge of free energy, energy storage device, fuels and corrosion to design environment friendly & sustainable devices
CO5. Able to apply the knowledge of different instrumental techniques to analyse unknown engineering materials

CO v/s PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	2	2	2	-	-	-	-	-	2	2
2	3	3	3	3	-	-	2	-	-	-	2	2
3	3	3	-	-	-	-	3	-	-	-	3	2
4	3	3	3	2	-	-	3	-	-	-	3	2
5	3	3	3	3	2	-	-	-	-	-	2	2

COURSE CONTENT

Module 1 - Elements and their properties (6L)

1. **Elements and their properties (3L)**

Bohr's theory for one electron system,Hydrogen spectrum, Quantum numbers, Atomic orbitals, Pauli's exclusion principle, Hund's rule, exchange energy, Aufbau principle,Electronic configuration and Magnetic properties.

2. **Periodic Table for Engineers (3L)**

Modern Periodic table, Periodic properties, study ofadvanced functionalmaterials likeSilicones, Silicates, Zeolite and alloys like steel, mischmetall, Neodymium alloy and their applications

Module 2 - Energy devices and Semiconductors (6L)

1. **Use of free energy in chemical equilibria (3L)**

Laws of Thermodynamics, Enthalpy, Entropy, Spontaneity, Electrochemical Cell, Dry Cell, Mercury Cell, Lead Storage batteries, Ni-Cd Cells, Fuel Cells, Solar Cells, Nernst equation and applications, Electrochemical sensors

2. **Crystals and Semiconductors (3L)**

Crystals and their defects, Stoichiometric and Non-stoichiometric defects, Band theory and Doping, n-type and p-type semiconductors, Superconductors

Module 3 –Industrial Applications of Chemistry (8L)

1. **Advanced Polymeric materials (3L)**

Classification, Engineering Plastics, conducting polymers, bio polymers, polymer composites

2. **Industrial corrosion (2L)**

Classification, Effects of corrosion, Preventive measures

3. **Analysis of Water Quality (1L)**

Water quality parameters and treatment

4. **Nano materials (1L)**

Synthesis of Nano materials, Applications in modern devices

5. **Basic Computational Chemistry (1L)**

Introduction of computational chemistry and their applications

Module 4 – Organic Reaction Products and their spectroscopic analysis (4L)

1. **Organic Reactions (2L)**

Substitution, Elimination and Addition reactions

2. **Drug designing and synthesis (1L)**

Paracetamol, Aspirin

3. **Spectroscopic Analysis (1L)**

UV – Visible Spectra, IR spectra

Suggested Text Books

- Fundamentals of Engineering Chemistry, Dr. Sudip bandopadhyay & Dr. Nirmal Hazra
- Chemistry –I, Gourkrishna Das Mohapatro
- A text book of Engineering Chemistry, Dr. Rajshree Khare
- Engineering Chemistry, U. N. Dhar
- Physical Chemistry, P.C. Rakshit

- **Reference Books**
- Engineering Chemistry, Jain & Jain
- Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishna
- text book of Engineering Chemistry, Jaya Shree Anireddy

ENVIRONMENTAL SCIENCE
PAPER CODE: HU104
Contact: (3:0:0)
Credits: 2
Contact Hours: 24L
Prerequisites: Knowledge of Science up to 12th standard.

Course Objective(s)

This course will enable the students to,

- Realize the importance of environment and its resources.
- Apply the fundamental knowledge of science and engineering to assess environmental and health risk.
- Know about environmental laws and regulations to develop guidelines and procedures for health and safety issues.
- Solve scientific problem-solving related to air, water, land and noise pollution.

Course Outcome

CO	Statement
C01	Able to understand the natural environment and its relationships with human activities
C02	The ability to apply the fundamental knowledge of science and engineering to assess environmental and health risk
C03	Ability to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues
CO4	Acquire skills for scientific problem-solving related to air, water, noise & land pollution.

CO – PO Mapping

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Able to understand the natural environment and its relationships with human activities	2	2	3	-	-	2	3	3	-	-	1	2
2	The ability to apply the fundamental knowledge of science and engineering to assess environmental and health risk	3	3	3	1	1	2	3	3	-	-	1	2
3	Ability to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues	3	3	3	2	1	2	3	3	-	-	1	2
4	Acquire skills for scientific problem-solving related to air, water, noise & land pollution.	1	1	1	1	2	2	3	3	-	-	1	2
AVERAGE		2	2	2	1	1	2	3	3	-	-	1	2

Module 1 - Resources and Ecosystem (6L)

3. Resources (2L)

Types of resources, resistance to resources, Human resource, Population Growth models: Exponential Growth, logistic growth

4. Ecosystem (3L)

Components of ecosystem, types of ecosystem, Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Food chain, Food web.

5. Energy and Environment(1L)

Conventional energy sources, coal and petroleum, Green energy sources, solar energy, tidal energy, geothermal energy, biomass

Module 2 – Environmental Degradation (9L)

3. Air Pollution and its impact on Environment (3L)

Air Pollutants, primary & secondary pollutants, Criteria pollutants, Smog, Photochemical smog and London smog, Greenhouse effect, Global Warming, Acid rain, Ozone Layer Depletion.

4. Water Pollution and its impact on Environment (3L)

Water Pollutants, Oxygen demanding wastes, heavy metals, BOD, COD, Eutrophication, Hardness, Alkalinity, TDS and Chloride, Heavy metal poisoning and toxicity.

5. Land Pollution and its impact on Environment (2L)

Solid wastes, types of Solid Waste, Municipal Solid wastes, hazardous wastes, bio-medical wastes, E-wastes

6. Noise Pollution and its impact on Environment (1L)

Types of noise, Noise frequency, Noise pressure, Noise intensity, Noise Threshold limit, Effect of noise pollution on human health.

Module 3 – Environmental Management (6L)

6. **Environmental Impact Assessment (1L)**

   Objectives of Environmental management, Components of Environmental Management, Environmental Auditing, Environmental laws and Protection Acts of India

7. **Pollution Control and Treatment (2L)**

   Air Pollution controlling devices, Catalytic Converter, Electrostatic Precipitator, etc., Waste Water Treatment, Noise pollution control.

8. **Waste Management (3L)**

   Solid waste management, Open dumping, Land filling, incineration, composting, E-waste management, Biomedical Waste management.

Module 4 – Disaster Management (3L)

4. **Study of some important disasters (2L)**

   Natural and Man-made disasters, earthquakes, floods drought, landside, cyclones, volcanic eruptions, tsunami, Global climate change. Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

5. **Disaster management Techniques (1L)**

   Basic principles of disasters management, Disaster Management cycle, Disaster management policy, Awareness generation program

Text Books:

1. Basic Environmental Engineering and Elementary Biology (For MAKAUT),

Gourkrishna Dasmohapatra, Vikas Publishing.

2. Basic Environmental Engineering and Elementary Biology, Dr. Monindra Nath Patra & Rahul Kumar Singha, Aryan Publishing House.

3. Textbook of Environmental Studies for Undergraduate Courses, Erach Barucha for UGC, Universities Press

Reference Books:

1. A Text Book of Environmental Studies, Dr. D.K. Asthana & Dr. Meera Asthana, S.Chand Publications.

2. Environmental Science (As per NEP 2020), Subrat Roy, Khanna Publisher

Paper Name: Indian knowledge System
Paper Code: HU105
Credit: 01
No. of lectures: 12
Prerequisites: Knowledge up to 12th standard.

CO1: To recall & state thought process of social setting in ancient India to identify the roots and details of some contemporary issues faced by Indians

CO 2: The students are able to identify & inspect the importance of our surroundings& culture to design & formulate sustainable developmental solutions

CO 3: To develop the ability to understanding the issues related to 'Indian' culture, tradition and its composite character to apply the same in the socio-technological developments in present scenario

C0 4: The students are able to relate & assess Indian Knowledge System in the health care, architecture, agriculture & other systems .

Module-1 3L

An overview of Indian Knowledge System (IKS): Importance of Ancient Knowledge - Definition of IKS - Classification framework of IKS - Unique aspects of IKS.
The Vedic corpus: Vedas and Vedangas - Distinctive features of Vedic life.
Indian philosophical systems: Different schools of philosophy.

Module-2 3L

Salient features of the Indian numeral system: Importance of decimal representation - The discovery of zero and its importance - Unique approaches to represent numbers.

Highlights of Indian Astronomy: Historical development of astronomy in India

Module-3 3L

Indian science and technology heritage : Metals and metalworking - Mining and ore extraction –Physical structures in India - Irrigation and water management - Dyes and painting technology - Surgical Techniques - Shipbuilding

Module-4 3L

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, Traditional Knowledge in agriculture, Traditional societies depend on it for their food and healthcare needs.

Text Book:

1) Introduction to Indian knowledge system: concepts and applications-Mahadevan B.Bhat, Vinayak Rajat, Nagendra Pavana R.N.,PHI

Reference Books:

1)Traditional Knowledge system in India, Amit Jha, Atlantic Publishers

2) S. N. Sen and K. S. Shukla, *History of Astronomy in India*, Indian National Science Academy, 2nd edition, New Delhi, 2000

CO and PO mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	-	-	2	3	-	3	-	2	3	1	-	2
CO2	-	-	2	-	-	3	3	2	3	3	-	
CO3	-	-	2	-	-	3	3	1	3	1	-	2
CO4			2			3	3	2	3			

Department: Information Technology
1st Year 1st Semester

B. PRACTICAL

Course Name: PROGRAMMING FOR PROBLEM SOLVING LAB
Course Code: IT191
Contact Hours: 3L/Week
Total Contact Hours: 36, Credits: 1.5
Prerequisites: Knowledge up to 12th standard.

Course Outcomes	Name of Course Outcomes
CO1	To identify the working of different operating systems like DOS, Windows, Linux
CO2	To express programs in C language
CO3	To implement programs connecting decision structures, loops
CO4	To experiment with user defined functions to solve real time problems
CO5	To write C programs using Pointers to access arrays, strings, functions, structures and files

CO-PO-PSO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	2						2	3	2	3	3
CO2	2	2	3	3	3							3	2	2	3
CO3	2	3	2	2	2							3	2	3	2
CO4	3	2	2	3	3							2	2	2	2
CO5	2	2	2	1	1						2	3	3	3	3

Course Content:

Module-1: Familiarization with some basic commands of DOS and Linux. File handling and Directory structures, file permissions, creating and editing simple C program in different editor and IDE, compilation and execution of C program. Introduction to Code block.

Module-2: Problem based on

a) Basic data types
b) Different arithmetic operators.
c) Printf( ) and scanf( ) functions.

Module-3: Problem based on conditional statements using

a) if-else statements
b) different relational operators
c) different logical operators

Module-4: Problem based on

a) **for** loop
b) **while** loop
c) do-while loop

Module-5: Problem based on

a) How to write a menu driven program using switch-case statement
b) How to write a function and passing values to a function
c) How to write a recursive function.

Module-6: Problem based on

a) How to use array (both I-Dand2-D).
b) How to pass an array to a function.

Module-7: Problem based on manipulation of strings in different way.

Module-8: Problem based on

a) How to handle compound variables in C
b) How to handle file in C
c) How to use command line argument in C.

Textbook:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. KanetkarY. -LetusC, BPBPublication,15thEdition.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. K R Venugopal & S R Prasad – MASTERING C, TMH, 2nd Edition.

Paper Name: BASICS ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY
Paper Code: EE(IT)191
Category: -Major (Core)
L-T-P: 0-3-0, Credit: 1.5, Total Lecture: 36
Prerequisites: Knowledge up to 12th standard.

CO	Statement
CO1	To Analyze a given network by applying KVL and KCL.
CO2	To Examine the Operation of DC Motor.
CO3	To Examine the Operation of Basic Electronics Devices and ICs.
CO4	To design simple electronics circuits.

List of Experiments: -

1. Familiarization with different passive and active electrical & electronic components.
2. Familiarization with different Electrical & Electronics Instruments.
3. Verification of KVL and KCL.
4. Forward and reversal of DC shunt motor.
5. Speed control of DC shunt motor.
6. Study of the P-N junction diode V-I characteristics (Forward & Reverse Bias).
7. Study of the Characteristics of Zener diode (Forward & Reverse Bias).
8. Study of the Input and Output characteristics of BJT in CE mode.
9. Determination of offset voltage, offset current & bias current of OPAMP(IC741).
10. Determination of CMRR and slew rate of OPAMP(IC741).
11. Determination of inverting and non-inverting gain of OPAMP(IC741).
12. Extramural Experiment.

Textbooks:

1. Handbook of Laboratory Experiments in Electronics Engineering Vol. 1, Author Name: A.M. Zungeru, J.M. Chuma, H.U. Ezea, and M. Mangwala, Publisher -Notion Press Electronic Devices and Circuit Theory by Robert Boylestad Louis Nashelsky,7th Edition, Prentice Hall Experiments Manual for use with Grob's Basic Electronics 12th Edition by Wes Ponick, Publisher-McGraw Hill, 2015.
2. Laboratory Manual for 'Fundamentals of Electrical & Electronics Engineering': A handbook for Electrical & Electronics Engineering Students by Manoj Patil (Author), Jyoti Kharade (Author), 2020.
3. The Art of Electronics, Paul Horowitz, Winfield Hill,Cambridge University Press, 2015.
4. A Handbook of Circuit Math for Technical Engineers, Robert L. Libbey CRC Press, 05-Jun-1991.

Reference Books:

1. Basic Electrical and Electronics Engineering, Author:S. K. Bhattacharya, Publisher: Pearson Education India,2011
2. Practical Electrical Engineering
3. By Sergey N. Makarov, Reinhold Ludwig, Stephen J. Bitar, Publisher: Springer International Publishing, 2016
4. Electronics Lab Manual (Volume 2) By Navas, K. A. Publisher: PHI Learning Pvt. Ltd. 2018
5. Practical Electronics Handbook, Ian R. Sinclair and John Dunton, Sixth edition 2007, Published by Elsevier Ltd.

CO-PO Course Articulation Matrix Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO 7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	2	3	2	-	2	-	-	2	-	2	3
CO2	3	3	2	3	-	2	-	-	3	-	2	2
CO3	3	2	2	3	-	2	-	-	2	-	3	3
CO4	3	3	2	2	-	2	-	-	3	-	2	3

Paper Name: Technical Seminar Presentation
Paper Code: HU(IT)191
Total Contact Hours: 36,
Credit: 1.5

Pre requisites: A basic knowledge of listening and speaking skills and the ability to infer meaning from audio-video/online lessons and Communication Competence.

Course Objective: To maximize exposure and train students in the professional use of English in the globalized workplace.

Course Outcome:

CO	Statement
CO1	Able to develop advanced verbal and nonverbal communication skills through Power Point presentation.
CO2	Able demonstrate interpersonal skills through Group Discussion both fororganizational communication and campus recruitment drive.
CO3	Able to recognize and apply the knowledge of public speaking.
CO4	Able to be industry ready professionals by various personality development programs.
CO5	Understand and write a detailed technical report as per organizational needs.

Course contents:

Module 1: Presentation [2L+6P]
(a)Teaching Presentation as a Skill
(b)Speaking Strategies and Skills
(c)Media and Means of Presentation
(d)Extended Practice and Feedback

Module 2: Effective Presentation [2L+6P]
a) Rules of making micro presentation.
b) Assignment on micro presentation.
c) Need for expertise in oral presentation.
d) Assignment on Oral presentation.
e) Macro Presentation in Groups.

Module 3: Writing a Technical Report [2L+6P]
(a)Organizational Needs for Reports and types
(b)Report Formats

(c)Report Writing Practice Sessions and Workshops

Module 4: Speaking Skills [2L+6P]

(a)The Need for Speaking: Content and Situation-based speaking
(b)Public Speaking Activities: [Just a Minute, Paired Role Play, Situational Speaking Exercises]
(c)The Pragmatics of Speaking—Pronunciation practice and learner feedback.

Text / Reference Books:

Technical communication By Meeenakshi Raman and Sangeeta Sharma; Oxford Publication.

CO-PO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	-	3	-	3	2	-	-	3	3	1	3
CO2	3	3	-	-	-	3	-	-	3	3	-	3
CO3	2	2	2	-	-	2	1	-	3	3	1	3
CO4	2	-	-	-	1	3	-	-	3	3	1	3
CO5	1	2	-	-	2	2	-	2	3	3	1	3

COURSE NAME: ENGINEERING GRAPHICS & DESIGN LAB
COURSE CODE: ME(IT) 191
CONTACT: 0:0:3
CREDITS: 1.5

Prerequisites: Basic knowledge of geometry.

Course Outcomes: Upon successful completion of this course, the student will be able to:
CO1: Learn the basics of drafting
CO2: Understand the use of drafting tools which develops the fundamental skills of industrialdrawings.
CO3: Apply the concept of engineering scales, dimensioning and various geometric curvesnecessary to understand design of machine elements.
CO4: Analyse the concept of projection of line, surface and solids to create the knowledge baseof orthographic and isometric view of structures and machine parts.
CO5: Evaluate the design model to different sections of industries as well as for research &development.

Course Contents:

Basic Engineering Graphics: 3P

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Module 1: Introduction to Engineering Drawing 6P
Principles of Engineering Graphics and their significance, Usage of Drawing instruments, lettering, Conic sections including Rectangular Hyperbola (General method only); Cycloid, Epicycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

Module 2: Orthographic & Isometric Projections 6P
Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes on inclined Planes - Auxiliary Planes; Projection of Solids inclined to both the Planes- Auxiliary Views; Isometric Scale, Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice- versa.

Module 3: Sections and Sectional Views of Right Angular Solids 6P
Drawing sectional views of solids for Prism, Cylinder, Pyramid, Cone and project the

true shape ofthe sectioned surface, Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw sectional orthographic views of objects from industry and dwellings (foundation to slab only).

Computer Graphics: 3P

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modeling; Solid Modeling.

Module 4: Overview of Computer Graphics 3P

Demonstration of CAD software [The Menu System, Toolbars (Standard, Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Zooming methods, Select and erase objects].

Module 5: CAD Drawing, Customization, Annotations, layering 6P

Set up of drawing page including scale settings, ISO and ANSI standards for dimensioning and tolerance; Using various methods to draw straight lines, circles, applying dimensions and annotations to drawings; Setting up and use of Layers, changing line lengths (extend/lengthen); Drawing sectional views of solids; Drawing annotation, CAD modeling of parts and assemblies with animation, Parametric and nonparametric solid, surface and wireframe modeling, Part editing and printing documents.

Module 6: Demonstration of a simple team design project 3P

Illustrating Geometry and topology of engineered components: creation of engineering models andtheir presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; Meshed topologies for engineering analysis and tool-path generation for component manufacture, use of solid-modeling software for creating associative models at the component and assembly levels.

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar PublishingHouse
2. K. Venugopal, Engineering Drawing + AutoCAD, New Age International publishers

Reference Books:

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, KhannaPublishing House
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.

CO-PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2			2									2	2	2
CO2	2			2									2	2	2
CO3	3			2									2	2	2
CO4	3			3									3	3	2
CO5	3	2		3	2								3	3	2

Course Name: Engineering Physics-I Lab
Code: PH(IT)191
Contact Hours: 0:0:3
Credit: 1.5
Prerequisites: Knowledge of Physics up to 12^{th} standard.

Course Objectives:

The aim of course is to provide adequate exposure and develop insight about the basic principles of physical sciences and its practical aspects which would help engineers to learn underlying principles of various tools and techniques they use in core engineering and related industrial applications. The course would also inculcate innovative mindsets of the students and can create awareness of the vital role played by science and engineering in the development of new technologies.

Course Outcomes (COs):

After attending the course students' will be able to

CO1 : demonstrate experiments allied to their theoretical concepts

CO2 : conduct experiments using LASER, Optical fiber.

CO3 : participate as an individual, and as a member or leader in groups in laboratory sessions actively CO4 : analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiment.

CO5: Design solutions for real life challenges.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3	3	--	--	--	--	--	--	--
CO2	2	3	2	3	3	--	--	--	--	--	--	--
CO3	2	3	2	3	3	--	--	--	--	--	--	--
CO4	2	2	3	2	3	--	--	--	--	--	--	--
CO5	2	2	3	2	3	--	--	--	--	--	--	--

Course Content:

General idea about Measurements and Errors (One Mandatory):

i) Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.

Experiments on Classical Physics (Any 4 to be performed from the following experiments):

1. Study of Torsional oscillation of Torsional pendulum & determination of time using various load of the oscillator.
2. Determination of Young's moduli of different materials.
3. Determination of Rigidity moduli of different materials.
4. Determination of wavelength of light by Newton's ring method.
5. Determination of wavelength of light by Laser diffraction method.
6. Optical Fibre-numerical aperture, power loss.

Experiments on Quantum Physics (Any 2 to be performed from the following experiments):

7. Determination of Planck's constant using photoelectric cell.
8. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
9. Determination of Stefan's Constant.
10. Study of characteristics of solar cell.

Perform atleast one of the following experiments :

11. Determination of Q factor using LCR Circuit.
12.Study of I-V characteristics of a LED/LDR

**In addition it is recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

Probable experiments beyond the syllabus:

1. Study of dispersive power of material of a prism.
2. Study of viscosity using Poiseuille's capillary flow method/using Stoke's law.
3. Determination of thermal conductivity of a bad/good conductor using Lees-Charlton / Searle apparatus.
4. Determination of the angle of optical rotation of a polar solution using polarimeter.
5. Any other experiment related to the theory.

Recommended Text Books for Engineering Physics Lab:

Waves & Oscillations:

1. Vibration, Waves and Acoustics- Chattopadhyay and Rakshit Classical & Modern

Optics:

2. A text book of Light- K.G. Mazumder & B.Ghosh (Book & Allied Publisher)

Quantum Mechanics-I

1. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)

Solid State Physics:

1. Solid State Physics and Electronics-A. B. Gupta and Nurul Islam (Book & Allied Publisher)

Text Books:

1. Practical Physics by Chatterjee & Rakshit (Book & Allied Publisher)

2. Practical Physics by K.G. Mazumder (New Central Publishing)

3. Practical Physics by R. K. Kar (Book & Allied Publisher)

Course Name: ENGINEERING CHEMISTRY LAB
Paper Code: CH (IT)191
Total Contact Hours: 24
Credit: 1
Prerequisites: 10+2

Course Objective

- Study the basic principles of pH meter and conductivity meter for different applications
- Analysis of water for its various parameters & its significance in industries
- Learn to synthesis Polymeric materials and drugs
- Study the various reactions in homogeneous and heterogeneous medium

Course Outcome

CH191.1: Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.
CH191.2: Able to analyse and determine the composition and physical property of liquid and solid samples when working as an individual and also as a team member
CH191.3: Able to analyse different parameters of water considering environmental issues
CH191.4: Able to synthesize drug and sustainable polymer materials.
CH191.5: Capable to design innovative experiments applying the fundamentals of modern chemistry

CO-PO Mapping

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1	3	1	-	2	3	-	-	-	-	1
2	2	2	1	1	-	1	-	-	-	1	-	1
3	-	-	-	-	-	-	-	-	3	3	2	2
4	2	1	2	2	-	-	1	-	-	-	-	2
5	3	3	3	3	1	1	1	1	-	-	2	2

COURSE CONTENT

1. Synthesis of Silver Nanoparticles doped organic thin film for organic transistors.
2. Preparation of Si-nano crystals for future memory devices.
3. Determination of the concentration of the electrolyte through conductance measurement.
4. Green Synthesis of ZnO based Polymer Nano composites.
5. Determination of the concentration of the electrolyte through pH measurement.
6. Determination of water quality measurement techniques.
7. Isolation of graphene from dead dry batteries and their use for temporary soldering.
8. Synthesis of polymers for electrical devices and PCBs.
9. Determination of Partition Coefficient of acetic acid between two immiscible liquids.
10. Computational optimization of molecular geometry
11. Drug design and synthesis
12. Rheological properties of the Newtonian fluids
13. Innovative Experiments

Department: Information Technology
SYLLABUS
1st Year 2nd Semester

A. THEORY

Course Name: DATA STRUCTURE AND ALGORITHM
Course Code: IT201
Contact (Periods/Week): 3L/Week
Total Contact Hours: 36, Credits: 3
Prerequisites: Knowledge of Programming Skills for Problem Solving.

Course Objectives:

1. **To learn the basics of abstract data types.**
2. **To learn the principles of linear and nonlinear data structures.**
3. **To build an application using sorting and searching.**

Course Outcomes	Name of Course Outcomes
CO1	To identify how the choices of data structure & algorithm methods impact the performance of program.
CO2	To express problems based upon different data structure for writing programs.
CO3	To implement programs using appropriate data structure & algorithmic methods for solving problems.
CO4	To explain the computational efficiency of the principal algorithms for sorting, searching, and hashing.
CO5	To write programs using dynamic and static data structures and building applications for real world problems.

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		2	3						1	3	1	1	1
CO2	3	2	2	2	2							2	3	2	2
CO3	2	3	3	2	3						1	2	3	3	3
CO4	2	2	2	3	1							1	2	1	2
CO5	2	3	3	3	2						1	2	3	3	3

Course Content:

Module 1: Introduction [4L]

Concepts of data and information; Concept of Abstract Data Type, Data Structure and Data Type. Classification of Data Structures- Primitive and Non-Primitive Data Structure, Linear and Non-Linear Data Structure. Need of Data Structures. (1L)

Concept of algorithms and programs, Different methods of representing algorithm; Algorithm analysis, time and space analysis of algorithms – Asymptotic notations like Big Oh (O), Small Oh(o), Big Omega(Ω), Small Omega(ω) and Theta(Θ) notation (definition and significance). (3L)

Module 2: Non-Restricted Linear Data Structure[9L]

List or Linear List: Definition and Example, List as ADT. Representation of Linear List- Sequential Representation and Linked Representation.

Array: Introduction to sequential representation, Linearization of multidimensional array. Application of array- representation of polynomial using array, Representation of Sparse matrix using array.

Linked List: Introduction to linked representation, Implementation of different types of linked list- Singly linked list, Doubly linked list, Circular linked list, Circular Doubly Linked List. Application of Linked list- Representation of polynomial.

Module 3: Restricted Linear Data Structure [6L]

Stack: Definition of Stack, implementations of stack using array and linked list, Applications of stack- infix to postfix conversion, Postfix Evaluation

Recursion: Principles of recursion - use of stack, tail recursion. Tower of Hanoi using recursion.

Queue: Definition of Queue; Implementation of queue using array-physical, linear and circular model;Implementation of queue using linked list.

Dequeue - Definition and different types of dequeue.

Module 4: Nonlinear Data structures [9L]

Trees and Binary Tree:

Basic terminologies; Definition of tree and binary tree. Difference between tree and binary tree, Representationof binary tree (using array and linked list)

Binary tree traversal (pre-, in-, post- order); Threaded binary tree- definition, insertion and deletion algorithm;Binary search tree- Definition, insertion, deletion, searching algorithm;

Height balanced binary tree: AVL tree- definition, insertion and deletion with examples only.

m –Way Search Tree: B Tree – Definition, insertion and deletion with examples only; B+ Tree – Definition,insertion and deletion with examples only.

Heap: Definition (min heap and max heap), creation, insertion and deletion algorithm.

Application of heap(priority queue and sorting).

Graphs: Definition and representation (adjacency matrix, incidence matrix and adjacency list).

Graph traversal– Depth-first search (DFS), Breadth-first search (BFS) - concepts of edges used in DFS and BFS(tree-edge, back-edge, cross-edge, and forward-edge).

Module 5: Sorting and Searching [8L]

Sorting Algorithms: Definition and need of sorting, different types of sorting algorithm (internal, external, stable, in-place, comparison based); Factors affecting sorting Methods, Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Radix sort – algorithm with analysis (time complexity)

Searching: Factors affecting searching Methods; Sequential search –algorithm with analysis (time complexity); improvement using sentinel.

Binary search and Interpolation Search algorithm with analysis (time complexity)

Hashing: Introduction and purpose of Hashing and Hash functions (division, folding and mid-square), Collisionresolution techniques.

Text book:

1. Data Structures Through 'C' Language by Samiran Chattopadhyay, Debabrata Ghosh Dastidar, Matangini Chattopadhyay, Edition: 2001, BPB Publications
2. Fundamentals of Data Structures of C by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed 2nd Edition,Universities Press

Reference Books:

1. Data Structures, Algorithms, and Software Principles in C by Thomas A. Standish, 1 Edition, Pearson.
2. Data Structures by S. Lipschutz, Special Indian Edition, Tata McGraw Hill Education (India) PrivateLimited
3. Data Structures and Program Design in C by Robert L. Kruse, Bruce P. Leung 2nd Edition, Pearson
4. Data Structures in C by Aaron M. Tenenbaum, 1St Edition, Pearson

Course Name: ENGINEERING CHEMISTRY
Paper Code: CH (IT) 201
Total Contact Hours: 24
Credit: 2
Prerequisites:10+2

COURSE OBJECTIVE

- To understand the basic principles of elements, organic reactions, drug synthesis and technological aspects of modern chemistry
- To apply the knowledge of different engineering materials, advanced polymers, and nanomaterials to solve complex engineering problems
- To analyse and evaluate quality parameters of water and its treatment
- Apply the knowledge of free energy, energy storage device, semiconductors, fuels and corrosion to design environment friendly & sustainable devices
- Apply the knowledge of different instrumental techniques to analyse unknown engineering materials.

COURSE OUTCOME

CO1. Able to understand the basic principles of elements, organic reactions drug synthesis and computational chemistry
CO2. Able to apply the knowledge of different engineering materials, advanced polymers, and nanomaterials to solve complex engineering problems
CO3. Able to analyse and evaluate water quality parameters and its treatment
CO4. Able to the knowledge of free energy, energy storage device, fuels and corrosion to design environment friendly & sustainable devices
CO5. Able to apply the knowledge of different instrumental techniques to analyse unknown engineering materials

CO v/s PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	2	2	2	-	-	-	-	-	2	2
2	3	3	3	3	-	-	2	-	-	-	2	2
3	3	3	-	-	-	-	3	-	-	-	3	2
4	3	3	3	2	-	-	3	-	-	-	3	2
5	3	3	3	3	2	-	-	-	-	-	2	2

COURSE CONTENT

Module 1 - Elements and their properties (6L)

6. Elements and their properties (3L)

Bohr's theory for one electron system, Hydrogen spectrum, Quantum numbers, Atomic orbitals, Pauli's exclusion

principle, Hund's rule, exchange energy, Aufbau principle, Electronic configuration and Magnetic properties.

7. **Periodic Table for Engineers (3L)**
   Modern Periodic table, Periodic properties, study of advanced functional materials like Silicones, Silicates, Zeolite and alloys like steel, mischmetall, Neodymium alloy and their applications

Module 2 - Energy devices and Semiconductors (6L)

7. **Use of free energy in chemical equilibria (3L)**
   Laws of Thermodynamics, Enthalpy, Entropy, Spontaneity, Electrochemical Cell, Dry Cell, Mercury Cell, Lead Storage batteries, Fuel Cells, Solar Cells, Nernst equation and applications, Electrochemical sensors

8. **Crystals and Semiconductors (3L)**
   Crystals and their defects, Stoichiometric and Non-stoichiometric defects, Band theory and Doping, n-type and p-type semiconductors, Superconductors

Module 3 –Industrial Applications of Chemistry (8L)

9. **Advanced Polymeric materials (3L)**
   Classification, Engineering Plastics, conducting polymers, bio polymers, polymer composites

10. **Industrial corrosion (2L)**
    Classification, Effects of corrosion, Preventive measures

11. **Analysis of Water Quality (1L)**
    Water quality parameters

12. **Fuels and their applications (2L)**
    Classification of Fuels, Calorific Values, Solid fuels; coal qualifications, Liquid Fuels; Knocking, Cetane and Octane number, composition and uses of gaseous fuels; water gas, Bio Gas, CNG, LPG

Module 4 – Organic Reaction Products and their spectroscopic analysis (4L)

6. **Organic Reactions (2L)**
   Substitution, Elimination and Addition reactions

7. **Drug designing and synthesis (1L)**
   Paracetamol, Aspirin

8. **Spectroscopic Analysis (1L)**
   UV – Visible Spectra, IR spectra

Suggested Text Books

(i) Fundamentals of Engineering Chemistry, By Dr. Sudip Bandopadhyay & Dr. Nirmal Kumar Hazra
(ii) A Text Book of Engineering Chemistry by Dr. Rajshree Khare
(iii) Engineering Chemistry 1, Gourkrishna Dasmohapatra

Reference Books

(i) Engineering Chemistry, 16th Edition, P.C. Jain & Dr. Monica Jain
(ii) A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co.
(iii) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
(iv) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan

Course Name: Engineering Mathematics - II
Paper Code: M(IT) 201
Contact (L: T: P): 3 : 0 : 0
Total Contact Hours: 36
Credit: 3

Prerequisites:
The students to whom this course will be offered must have the concept of (10+2) standard calculus.

Course Objectives:
The objective of this course is to familiarize the prospective engineers with techniques in ordinary differential equations, Laplace transform and numerical methods. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes (COs):
On successful completion of the learning sessions of the course, the learner will be able to:

CO1: Recall the properties related to ordinary differential equations, Laplace transform and numerical techniques.

CO2: Determine the solutions of the problems related to ordinary differential equations, Laplace transform and numerical techniques.

CO3: Apply appropriate mathematical tools of ordinary differential equations, Laplace transform and numerical techniques for the solutions of the problems.

CO4: Analyze engineering problems by using ordinary differential equation, Laplace transform and numerical Methods.

CO-PO/PSO Mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	2	3	1	2	-	-	-	-	-	-	-	1

Course Content:

Module I: First Order Ordinary Differential Equations (ODE) (9L)

Solution of first order and first-degree ODE: Exact ODE, Rules for finding Integrating factors, Linear ODE, Bernoulli's equation.

Solution of first order and higher degree ODE: solvable for p,solvable for y and solvable for $x$and Clairaut's equation.

Module II: Second Order Ordinary Differential Equations (ODE) (8L)

Solution of second order ODE with constant coefficients: C.F. &P.I., Method of variation of parameters, Cauchy-Euler equations.

Module III: Laplace Transform (LT) (12L)

Concept of improper integrals; Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property, LT of $tf(t)$, LT of $\frac{f(t)}{t}$, LT of derivatives of $f(t)$, LT of integral of $f(t)$, Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties, Convolution theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT.

Module IV: Numerical Methods (7L)

Introduction to error analysis, Calculus of finite difference. **Interpolation:** Newton forward and backward interpolation, Lagrange's interpolation. **Numerical integration:** Trapezoidal rule, Simpson's 1/3 rule. **Numerical solution of ordinary differential equation:** Euler method, Fourth order Runge-Kutta method.

Text Books:

1. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Kreyszig, E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Reference Books:

1. Guruprasad, S. A text book of Engineering Mathematics-I, New age International Publishers.
2. Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Veerarajan, T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Bali, N.P. and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
5. Thomas, G.B. and Finney, R.L., Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
6. Apostol, M., Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern, 1980.
7. Kumaresan, S., Linear Algebra - A Geometric approach, Prentice Hall of India, 2000.
8. Poole, D., Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
9. Bronson, R., Schaum's Outline of Matrix Operations. 1988.
10. Piskunov, N., Differential and Integral Calculus, Vol. I & Vol. II, Mir Publishers, 1969.

Course Name: Professional Communication
Paper Code: HU 201
Contact: 2:0:0
Total Contact Hours: 24
Credit: 2

Pre-requisites:	Basic (10+2) level of knowledge of English grammar, vocabulary reading and writing skills.
Course Objectives	The course aims to impart domain and industry-specific communication skills in a globalized context and to promote the understanding of business communication practices and cross-cultural dynamics.
Course Outcomes:	By pursuing this course, the students shall be able to
	CO1. Define, describe and classify the modalities and nuances ofcommunication in a workplace context.
	CO2. Review, appraise and understand the modes, contexts and appropriacy of communicating across cultures and societies.
	CO3. Identify, interpret and demonstrate the basic formats, templates of business and official communication.
	CO4. Identify, compare and illustrate reading strategies and basic writing strategies.
	CO5. Interpret, analyze and evaluate semantic-structural, interpersonal and multicultural dynamics in business communication.

Course Content:

Module 1:
Verbal and Non verbal communication **4 L**
Definition, Relevance and Effective Usage
Components of Verbal Communication: Written and Oral Communication
Components of Non-verbal Communication: Kinesics, Proxemics, Chronemics, HapticsParalanguage
Barriers to Effective Communication

Module 2:
Workplace Communication Essentials and Cross Cultural Communication **4L**
Communication at the Workplace—Formal and Informal Situations
Language in Use—Jargon, Speech Acts/Language Functions, Syntactical and Grammatical Appropriacy
Cultural Contexts in Global Business: High Context and Low Context Cultures

Understanding Cultural Nuances and Stereotyping
Achieving Culturally Neutral Communication in Speech and Writing

Module 3: **4L**

Reading Strategies and Basic Writing Skills

Reading: Purposes and Nature of Reading
Reading Sub-Skills—Skimming, Scanning, Intensive Reading
Reading General and Business Texts(Reading for Comprehension and Detailed Understanding)
Basic Writing Skills—Paragraph and Essay writing, writing technical documents
Writing Technicalities—Paragraphing, Sentence Structure and Punctuation

Module 4: **4L**

Report Writing

Nature and Function of Reports
Types of Reports
Researching for a Business Report
Format, Language and Style
Report Documentation

Module 5:

Employment Communication

a. Writing Business Letters (Enquiry, Order, Sales, Complaint, Adjustment, Job Application, Offer) 2**L**

b. Creating an Employee Profile-- Preparing a CV or Résumé.
Creating a Digital/Online Profile – LinkedIn (Résumé/Video Profile) **2L**

c. Writing Other Interoffice Correspondence--E-mails: types, convention, and etiquette, Memo, Notices and Circulars **2L**

d. Preparing Meeting Documentation—Drafting Notice and Agenda of Meetings, Preparing Minutes of Meetings. **2L**

References: -

1. Meenakshi Raman and Sangeetha Sharma. *Technical Communication*. 3rd edition. New Delhi:Oxford University Press, 2015.
2. Mark Ibbotson. *Cambridge English for Engineering*. Cambridge: Cambridge University Press,2008.
3. Mark Ibbotson. *Professional English in Use: Engineering*. Cambridge: Cambridge UP, 2009.
4. Lesikar et al. *Business Communication: Connecting in a Digital World*. New Delhi: TataMcGraw-Hill, 2014.
5. John Seeley. *Writing Reports*. Oxford: Oxford University Press, 2002.
6. Judith Leigh. *CVs and Job Applications*. Oxford: Oxford University Press, 2002.

7. Judith Leigh. *Organizing and Participating in Meetings*. Oxford: Oxford University Press,2002.
8. Michael Swan. *Practical English Usage*. Oxford: OUP, 1980.
9. Pickett, Laster and Staples. *Technical English: Writing, Reading & Speaking.* 8th ed. London: Longman, 2001.
10. Diana Booher. *E-writing: 21st Century Tools for Effective Communication*.

Links:-

1. Purdue University's Online Writing Lab (OWL)- https://owl.purdue.edu/
2. Business English Pod- https://www.businessenglishpod.com/

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	2	1	1	2	3	-	2
CO2	-	-	-	-	-	1	1	2	2	3	-	3
CO3	-	-	-	-	-	3	3	1	1	3	2	3
CO4	-	-	-	-	-	3	3	1	-	3	-	3
CO5						2	2	2	2	3	-	3

Course Name: Values and Ethics
Course Code: HU 202
Contacts: 2:0:0
Total Contact Hours: 24
Credit: 2
Prerequisite: None

CO1: Understand the core values that shape the ethical behavior of an engineer and Exposed awareness on professional ethics and human values.
CO2: understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories
CO3: understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field
CO4: Aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer
CO5: Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives

Module 1:
Value: Definition- Importance and application of Value in life- Formation of Value- Process of Socialization- self and integrated personality.
Types of values-Social, Psychological, Aesthetic, Spiritual, and Organizational-Value crisis in contemporary society: individual, societal cultural and management level. **(4)**
Module-2
Effects of Technological Growth- Rapid Technological growth and depletion of resources, Reports of the Club of Rome.
Problems of Technology transfer- Technology assessment impact analysis.
Human Operator in Engineering projects and industries- Problems of man, machine- interaction- Impact of assembly line and automation-Human centred Technology. **(4)**
Module-3
Impact of Ethics on Business Policies and Strategies – Utilitarianism – Principles of Utilitarianism - Criticism of Utilitarianism - Impact on Business Culture - Role of CEO in shaping Business Culture – Ethical Leadership – Characteristics **(4)**
Module-4
Types of Ethical issues - Internal Ethics of Business – Hiring Employees – Promotion - Wages – Job discrimination - its nature and extent- Exploitation of Employees – Discipline and Whistle Blowing **(2)**
Module-5
Markets and consumer Protection – Consumer rights – Unethical Practices in Marketing – Ethics of Competition and Fair Prices – Ethics in Advertising and False Claims - Environmental Protection and Ethics –Pollution Control – Ecological ethics **(4)**
Module-6
Social Responsibilities of Business – Definition and case study of Corporate Compliance; Responsibilities towards Customers, shareholders, employees – Social Audit – Objectives and Need for Social Audit – Methods of Social Audit – Benefits – Obstacles –
Social Audit in India. **(6)**

Text Books:

1) A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996
2) . S. K. Chakraborty: Values and Ethics in Organization, OUP

Reference Books:

1) U.C.Mathur, Corporate Governance & Business Ethics, Macmillan, 2005

2. Fernando. A. C., Business Ethics – An Indian Perspective, Pearson Publication, 2009.

3) Prem Vir Kapoor, Professional Ethics & Human Values, Khanna Publishing House, New Delhi

CO and PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	-	-	-	-	-	2	-	3		1	2	1
CO2	-	2	-	-	-	1	-	2	3	3	3	2
CO3	-	-	-	-	-	3	3	2	3	1	3	2
CO4		2				3	3		3		3	2
CO5						3					2	

Paper Name: Constitution of India
Paper Code: HU 203
Credit: 01
No. of lectures: 12

Course Outcome: On Completion of this course student will be able to

CO1: To Identify and explore the basic features and modalities of Indian constitution.

CO2: To Differentiate and relate the functioning of Indian parliamentary system at the centre and state level.

CO3: To Differentiate the various aspects of Indian Legal System and its related bodies.

Module 1: **History of Making of the Indian Constitution:** History. Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution: Preamble Salient Features **3L**

Module 2: Fundamental Rights, Fundamental Duties, Directive Principles of State Policy: 6L

The Right to Equality
The Right to Freedom: I (Article 19)
The Right to Freedom: II (Articles 20, 21 and 22)
The Right against Exploitation
The Right to freedom of Religion
Cultural and Educational rights
The Right to Property
The Right to Constitutional Remedies

Fundamental Duties

Module-3: Organs of Governance: 3L

Parliament - Composition - Qualifications and Disqualifications -Powers and Functions – Executive- President -Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions

Text Book:

1) Indian Constitution by D.D.Basu, The Publisher, LexisNexis
2) PM Bhakshi, The constitution of India, Universal Law, 14e, 2017

Reference Books:

1) Constitution of India by Subhas C Kasyap, Vitasta Publishing
2) The Constitution of India, P.M Bakshi, Universal Law Publishing Co.Ltd, New Delhi, 2003.
3) Indian Constitution Text Book - Avasthi, Avasthi, Publisher: LAKSHMI NARAIN AGARWAL
4) Introduction to the Constitution of India, Brij Kishore Sharma, PHI

CO-PO mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	-	-	-	-	-	2	-	3		1	-	
CO2	-	-	-	-	-	1	-	2		3	-	
CO3	-	-	-	-	-	3	-	2		1	-	

Department: Information Technology
1st Year 2nd Semester

B. PRACTICAL

Course Name: DATA STRUCTURE AND ALGORITHM LAB
Course Code: IT 291
Contact (Periods/Week):3L
Total Contact Hours: 36
Credits: 1.5
Prerequisites: Knowledge of Programming for Problem Solving Lab

Course Outcomes	Name of Course Outcomes
CO1	To identify the appropriate data structure as applied to specified problem definition.
CO2	To summarize operations like searching, insertion, deletion, traversing mechanism used on various data structures.
CO3	To implement practical knowledge of data structures on the applications.
CO4	To illustrate how to store, manipulate and arrange data in an efficient manner.
CO5	To write programs to access queue and stack using arrays and linked list, binary tree and binary search tree.

CO-PO-PSO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	3	-	-	-	-	-	-	2	1	1	1
CO2	3	2	2	3	3	-	-	-	-	-	3	2	3	2	2
CO3	2	3	3	-	2	-	-	-	-	-	-	2	3	3	3
CO4	2	2	1	3	2	-	-	-	-	-	2	3	2	1	2
CO5	2	2	3	1	2	-	-	-	-	-	-	3	3	3	3

Course Content:

Module 1: Implementing Non-Restricted Linear Data Structure [2 Lab]

Problem based on Implementation of Non-Restricted Linear Data Structure like- Implementation of list as data structure using array.
Implementation of list as data structure using linked list of different types. Implementation of polynomial as data structure using array and linked list. Implementation of sparse matrix as data stricture using array.

Module 2: Implementing Restricted Linear Data Structure [3 Lab]
Problem based on Implementation of Restricted Linear Data Structure like- Implementation of stack as data structure using array.
Implementation of stack as data structure using linked list.
Implementation of queue as data structure using array (physical, linear and circular model).
Implementation of queue as data structure using linked list.
Converting infix to post-fix and evaluating post-fix expression using stack. Implementing Tower-of-Hanoi problem.

Module 3: Implementing Non-Linear Data Structure [2 Lab]
Problem based on Implementation of Non-Linear Data Structure like Implementation of Binary Tree as data structure using array and linked list.
Implementation of Binary Search Tree (BST) as data structure using linked list.
Implementation of Heap as data structure using array.
Implementation of Priority Queue as data structure using Heap.

Module 4: Implementing Sorting and Searching algorithm [5 Lab]
Problem based on Implementation of Sorting and Searching algorithm
Implementation of Bubble sort using appropriate data structure.
Implementation of Selection sort using appropriate data structure.
Implementation of Insertion sort using appropriate data structure. Implementation of Quick sort using appropriate data structure.
Implementation of Merge sort using appropriate data structure.
Implementation of Heap sort using appropriate data structure.
Implementation of Radix sort using appropriate data structure.
Implementation of Sequential Search using appropriate data structure.
Implementation of Binary Search using appropriate data structure.
Implementation of hashing with collision resolution using linear and quadratic probing.

Text books:

1. Data Structures Through 'C' Language by Samiran Chattopadhyay, Debabrata Ghosh Dastidar, Matangini Chattopadhyay, Edition: 2001, BPB Publications.
2. Fundamentals of Data Structures of C by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed 2nd Edition,Universities Press.

Reference books:

1. Data Structures, Algorithms, and Software Principles in C by Thomas A. Standish, 1 Edition, Pearson.
2. Data Structures by S. Lipschutz, Special Indian Edition, Tata McGraw Hill Education (India) Private.
3. Limited Data Structures and Program Design In C by Robert L. Kruse, Bruce P. Leung 2nd Edition, Pearson.
4. Data Structures in C by Aaron M. Tenenbaum, 1St Edition, Pearson

ENGINEERING CHEMISTRY LAB

Course Name: ENGINEERING CHEMISTRY LAB
Paper Code: CH(IT)291
Total Contact Hours: 24
Credit: 1
Prerequisites: 10+2

Course Objective

- Study the basic principles of pH meter and conductivity meter for different applications
- Analysis of water for its various parameters & its significance in industries
- Learn to synthesis Polymeric materials and drugs
- Study the various reactions in homogeneous and heterogeneous medium

Course Outcome

CO1: Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.
CO2: Able to analyse and determine the composition and physical property of liquid and solid samples when working as an individual and also as a team member
CO3: Able to analyse different parameters of water considering environmental issues
CO4: Able to synthesize drug and sustainable polymer materials.
CO5: Capable to design innovative experiments applying the fundamentals of modern chemistry

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1	3	1	-	2	3	-	-	-	-	1
2	2	2	1	1	-	1	-	-	-	1	-	1
3	-	-	-	-	-	-	-	-	3	3	2	2
4	2	1	2	2	-	-	1	-	-	-	-	2
5	3	3	3	3	1	1	1	1	-	-	2	2

COURSE CONTENT

14. Determination of the concentration of the electrolyte through conductance measurement.
15. Determination of water quality measurement techniques.
16. Determination of the concentration of the electrolyte through pH measurement.
17. Estimation of Cu in brass
18. Estimation of Fe_2O_3 in Cement
19. Isolation of graphene from dead dry batteries and their use for temporary soldering.
20. Synthesis of Silver Nanoparticles doped organic thin film for organic transistors.
21. Estimation of corrosion in a given sample metal.
22. Preparation of Si-nano crystals for future memory devices.
23. Green Synthesis of ZnO based Polymer Nano composites.
24. Synthesis of polymers for electrical devices and PCBs.
25. Determination of Partition Coefficient of acetic acid between two immiscible liquids.
26. Drug design and synthesis
27. Rheological properties of the Newtonian fluids
28. Innovative Experiments

Paper Name: Professional Communication Lab
Paper Code: HU 291
Contact: (0:0:2)
Total Contact Hours: 26
Credit: 1
Pre requisites: Basic knowledge of LSRW skills.

Course Objectives: To train the students in acquiring interpersonal communication skills by focussing on language skill acquisition techniques and error feedback.

Course Outcome:
By pursuing this course, the students will be able to:
CO1: Recognize, identify and express advanced skills of Technical Communication in English through Language Laboratory.
CO2: Understand, categorize, differentiate and infer listening, speaking, reading and writing skills in societal and professional life.

CO3: Articulate and present the skills necessary to be a competent Interpersonal communicator.
CO4: Deconstruct, appraise and critique communication behaviours.
CO5: Adapt, negotiate and facilitate with multifarious socio-economical and professional arenas with effective communication and interpersonal skills.

Course Contents:

Module 1: Introduction to the Language Lab
a. The Need for a Language Laboratory
b. Tasks in the Lab
c. Writing a Laboratory Note Book

Module 2: Active Listening
a. What is Active Listening?
b. Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note-taking
c. Listening in Business Telephony

Module 3: Speaking
a. Speaking—Accuracy and Fluency Parameters
b. Pronunciation Guide—Basics of Sound Scripting, Stress and Intonation
c. Fluency-focussed activities—JAM, Conversational Role Plays, Speaking using Picture/Audio Visual inputs
d. Accuracy-focussed activities—Identifying Minimal Pairs, Sound Mazes, Open and Closed Pair Drilling, Student Recordings (using software)
e. Group Discussion: Principles and Practice
f. Giving a Presentation—Learning Presentation Basics and Giving Micro Presentations

Module 4: Lab Project Work
a. Writing a Book Review
b. Writing a Film Review
c. Scripting a Short Presentation (2 minutes)
d. Making a short video CV (1-2 minutes)

References:
1.IIT Mumbai**, Preparatory Course in English** syllabus
2. IIT Mumbai, **Introduction to Linguistics** syllabus
3. Sasikumar et al. *A Course in Listening and Speaking*. New Delhi: Foundation Books, 2005.
4. Tony Lynch, *Study Listening*. Cambridge: Cambridge UP, 2004.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	-	-	1	1	-	2	3	-	2
CO2	-	-	2	2	-	3	3	-	2	3	-	3
CO3	-	-	2	2	-	3	3	2	2	3	-	3
CO4	-	-	-	-	-	3	3	2	2	3	-	3
CO5	-	-	2	2	-	3	3	2	2	3	-	3

COURSE NAME: Workshop and Manufacturing Practices Lab
COURSE CODE: ME(IT)291
CONTACT: 0:0:3
CREDITS: 1.5

Prerequisite: Physics & Mathematics (10+2 Level)

CO1: Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
CO2: Understand the use of Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc.
CO3: Apply and performing operations like such as Marking, Cutting etc used in manufacturing processes.
CO4: Analyse the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.
CO5: Get hands on practice of in Welding and apply various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

Course Content:

3P

(i) Theoretical discussions:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. Fitting operations & power tools
3. Carpentry
4. Welding (arc welding & gas welding), brazing
5. Electrical & Electronics
6. Metal casting
7. CNC machining, Additive manufacturing, 3D Printing
8. Plastic molding & Glass Cutting

(ii) Workshop Practice:

At least 6 modules should be covered

Module 1 - Machine shop **6P**

Typical jobs that may be made in this practice module:

i. To make a pin from a mild steel rod in a lathe.

ii. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / ormilling machine.

Module 2 - Fitting shop **6P**

Typical jobs that may be made in this practice module: To make a Gauge from MS plate.

Module 3 – Carpentry Shop **6P**

Typical jobs that may be made in this practice module: To make wooden joints and/or a pattern or like.

Module 4 - Welding & Soldering shop **6P**

Typical jobs that may be made in this practice module:

i. Arc Welding: To join two thick (approx 5mm) MS plates by manual metal arc welding.

ii. Gas Welding: To join two thin mild steel plates or sheets by gas welding.

iii. House wiring, soft Soldering

Module 5 – Smithy & Casting **6P**

Typical jobs that may be made in this practice module:

i. A simple job of making a square rod from a round bar or similar.

ii. One/ two green sand moulds to prepare, and a casting be demonstrated.

Module 6 – CNC Machining & Laser Cutting **6P**

Typical jobs that may be made in this practice module:

i. At least one sample shape on mild steel plate should be made using CNC Milling / CNC Lathe Machine

ii. At least one sample shape on glass should be made using laser cutting machine.

Module 7 – 3D Printing **6P**

i) Exposure to a 3D printing machine,

ii) 3D printing of at least one sample model using available materials.

Examinations could involve the actual fabrication of simple components, utilizing one or more ofthe techniques covered above.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and NirjharRoy S.K., –Elements of Workshop

Technology‖, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Rao P.N., –Manufacturing Technology‖, Vol. I and Vol. II, Tata McGrawHill House, 2017.

Reference Books:

1. Gowri P., Hariharan and A. Suresh Babu, ManufacturingTechnology – I, Pearson Education, 2008.
2. Roy A. Lindberg, –Processes and Materials of Manufacture‖, 4th edition, Prentice Hall India, 1998.
3. Kalpakjian S. and Steven S. Schmid, Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition, 2002.
4. Manufacturing Science by A. Ghosh and A.K. Mallick,Wiley Eastern.
5. Principles of Metal Cutting/Principles of Machine Tools by G.C. Sen and A. Bhattacharya, New Central Book Agency, Kolkata.

CO-PO/PSO Mapping:

CO Codes	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PS O3
CO1	3						2		2	2					
CO2	3						2		2	2					
CO3	3						2		2	2			2		2
CO4	3						2		2	2			2		2
CO5	3	2	2				2		2	2					