



# Vidyalankar Institute of Technology

An Autonomous Institute affiliated to University of Mumbai

## Bachelor of Technology

in

## Information Technology

### First Year Scheme & Syllabus

(As per AICTE guidelines, with effect from the Academic Year 2022-23)

## Preamble

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated, and taken forward in a systematic manner. Therefore, autonomy for Vidyalankar Institute of Technology is not merely a transition from pre-cooked syllabi to self-designed curriculum. Autonomy curriculum of the Institute offers required academic flexibility with emphasis on industry requirements and market trends, employability and problem-solving approach which leads to improving competency level of learners with diverse strengths. In line with this, the curriculum framework designed is **Choice Based Credit and Grading System (CBCGS)**. Number of credits for each category of courses learnt by learners, internships and projects is finalized considering the scope of study and the ability that a learner should gain through the programme. The overall credits and approach of curriculum proposed is in line with AICTE model curriculum.

The curriculum comprises courses from various categories like basic sciences, humanities and social sciences, engineering sciences, general education and branch specific courses including professional electives and open electives. The curriculum has core courses of branch of engineering positioned and sequenced to achieve sequential and integral learning of the entire breadth of the specific branch. These courses are completed by third year of the engineering programme that enables learners to prepare for higher education during their final year. Professional elective courses, that begin from third year of programme, offer flexibility and diversity to learners to choose specialization from a basket of recent developments in their field of technology. The selection of unique professional elective courses based on industrial requirements and organizing them into tracks is a salient feature of this curricula ensuring employability. Open Elective courses cover multi-disciplinary, special skill development, project management and similar knowledge that make learner capable to work in industrial environment.

For holistic development of learners, apart from technical courses, Humanities and Social Science courses develop the required soft-skills and attitude amongst learners. Our curriculum also introduces Social Service Internship and Internship with institutes abroad along with courses like Design Thinking, Yoga and Meditation, Indian Traditional Knowledge System under General Education category. These general education courses aim to create balance in brain hemispheres and hence improve learners' clarity in thoughts and responses. In addition to this, the curriculum is augmented with Life Enrichment audit courses for knowledge inspiring experience.

Additionally, curriculum provides add-on Honours/Minor degree that involves field/ domain study. Learner can avail this degree by completing requirement of additional 15 credits.

Thus, the academic plan of VIT envisages a shift from summative to formative and competency-based learning system which will enhance learner's ability towards higher education, employability and entrepreneurship.

Chairman, Board of Studies  
Department of Information Technology  
Vidyalankar Institute of Technology

Chairman, Academic Council  
Vidyalankar Institute of Technology

**First Year B. Tech. Information Technology**  
**Course Structure and Evaluation Scheme**

**Semester: I**

Sr. No.	Course			Head of Learning	Credits	Evaluation Scheme (Marks)			Total marks (Passing@40% of total marks)
	Code	Nature	Name			ISA	MSE	ESE	
1	HS01	C	Effective Communication	Theory	2	15	20	40	075
		T	Effective Communication	Practical	1	25	-	25	050
2	HS05	C	E-waste and Environmental Management	Theory	2	15	20	40	075
3	BS14	C	Physics	Theory	2	15	20	40	075
		T	Physics	Practical	1	25	-	25	050
4	BS01	C	Engineering Mathematics-I	Theory	3	20	30	50	100
5	ES06	C	Fundamentals of Computer Hardware and Networking	Theory	2	15	20	40	075
		T	Fundamentals of Computer Hardware and Networking	Practical	1	25	-	25	050
6	ES04	C	Structured Programming	Theory	2	15	20	40	075
		T	Structured Programming	Practical	1	25	-	25	050
7	GEXX*	E	Any GE course from GE04 to GE10	As per course	2	25	-	50	075
<b>Total Credits</b>					<b>19</b>	-	-	-	-

ISA=In Semester Assessment, MSE=Mid Semester Examination, ESE=End Semester Examination  
C=Compulsory, T=Tandem, E=Elective, A=Audit

**\*Refer to Appendix A for the list of General Education (GE) courses. GE01, GE02 and GE03 are mandatory and will be offered by the department as per programme scheme. A subset of courses from GE04 to GE10 shall be offered against GEXX\* (Sr. No. 7). However, the subset will depend on the GE courses made available by the institute for that semester.**

**First Year B. Tech. Information Technology**  
**Course Structure and Evaluation Scheme**

**Semester: II**

Sr. No.	Course			Head of Learning	Credits	Evaluation Scheme (Marks)			Total marks (Passing@40% of total marks)
	Code	Nature	Name			ISA	MSE	ESE	
1	HS02	C	Professional Skills	Theory	2	15	20	40	075
		T	Professional Skills	Practical	1	25	-	25	050
2	BS03	C	Engineering Mathematics-II	Theory	3	20	30	50	100
3	ES01	C	Engineering Graphics	Theory	2	15	20	40	075
		T	Engineering Graphics	Practical	1	25	-	25	050
4	ES07	C	Fundamental of Logic Circuits	Theory	2	15	20	40	075
		T	Fundamental of Logic Circuits	Practical	1	25	-	25	050
5	ES05	C	Object-Oriented Programming	Theory	2	15	20	40	075
		T	Object-Oriented Programming	Practical	1	25	-	25	050
6	GE01	C	Design Thinking	Theory	2	15	20	40	075
		T	Design Thinking	Tutorial	1	50	-	-	050
7	GEXX*	E	Any GE course from GE04 to GE10	As per course	2	25	-	50	050
<b>Total Credits</b>					<b>20</b>	-	-	-	-

ISA=In Semester Assessment, MSE=Mid Semester Examination, ESA=End Semester Examination  
C=Compulsory, T=Tandem, E=Elective, A=Audit

**\*Refer to Appendix A for the list of General Education (GE) courses. GE01, GE02 and GE03 are mandatory and will be offered by the department as per programme scheme. A subset of courses from GE04 to GE10 shall be offered against GEXX\* (Sr. No. 7). However, the subset will depend on the GE courses made available by the institute for that semester.**

## Detailed syllabus of First Year Semester-I

**Course Name:** Effective Communication

**Course Code:** HS01

**Category:** Humanities, Social Sciences and Management

**Preamble:**

This course introduces learners to the basics of Communication Skills and English Language usage which will equip them with the requisite skillset for higher studies and placements. It considers the important foundational aspects of Professional Communication and English Proficiency. It acquaints the learners with modern communication tools and the basics of public speaking before an audience.

**Pre-requisites:**

Basic English Usage

**Course Objectives:**

- To enable learners to gain understanding of the cyclic process, methods, channels, and barriers of communication.
- To facilitate learners in developing the skills of active listening, impactful public speaking, reading strategies, and effective writing.
- To create awareness of strengthening English proficiency for competitive exam preparation and the art of comprehension and summarization.
- To introduce strategies for creating effective presentations using modern ICT enabled tools.

**Course Outcomes:**

Learner will be able to:

CO1: Use verbal/non-verbal cues at social and workplace situations by learning the basics of communication skills.

CO2: Employ listening strategies to become effective listeners and powerful speakers for speaking at social, academic and business situations.

CO3: Improved verbal aptitude to be equipped for competitive examinations and placements.

CO4: Make effective presentations and present before an audience with confidence.

CO5: Use reading strategies for faster comprehension, summarization and evaluation of texts.

CO6: Develop awareness of contemporary digital tools of communication.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	2	2	1

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075
Practical	25	-	25	050

**Detailed Syllabus:**

Module No.	Module Name	Content	No. of Hours
1	Fundamentals of Communication	Concept, Elements and Cycle of Communication, Methods of Communication (Verbal and Nonverbal), Objectives and Channels of Communication (Formal and Informal), Barriers to Communication: Physical, Mechanical, Psychological, Semantic, Socio-cultural, Cross-cultural	10
2	Listening & Speaking	Techniques to improve Listening, Listening-exercises, Speech writing and delivery , Different types of Speeches & Tips on Public Speaking	6
3	English Usage	Vocabulary Building (Etymology, Synonyms, Antonyms, One Word Substitutes) useful for TOEFL, GRE, Grammar Proficiency Tests (Articles, Prepositions, Tenses, Punctuation), Identifying Common Errors in Writing, Grammar Checkers and Sentence Correction Tools	4
4	Presentation Skills	Introduction to Presentation Skills, Creating Presentations-Content, Delivering Presentations before an audience, Using Presentation Software-Modern Presentation Tools	4
5	Comprehension & Summarization	Comprehension & Reading Strategies, Graphic Organizers (Mind Maps, Flow Charts, Tree Diagrams etc.), Summarization of technical passages within specified word limit	2
6	Communication Strategies for Virtual Age	Digital Content Creation, Infographics, ICT Tools, Social and Popular Media	4
<b>Total</b>			<b>30</b>

**Suggested List of Practicals:**

1. Ice Breakers/Introduction/Aptitude Test/English Proficiency Test
2. Extempore Speech Practice Session
3. Prepared Speech
4. Group Presentations on current and relevant topics
5. Situational Dialogue Writing and Delivery
6. Skits/Role play on Methods of Communication and Barriers of Communication

7. English Usage Practice on Grammar and Vocabulary
8. Virtual Lab

**Suggested List of Assignments:**

1. Written Assignment on Fundamentals of Communication (Individual)
2. Listening Activities and Exercises (Individual)
3. Aptitude test on Vocabulary and Grammar (Language Lab) (Individual)
4. Presentation on domain related topics (Group)
5. Comprehension & Summarization of technical passages
6. Digital Content Creation using ICT Tools

**Suggested List of Value-Added Home Assignments:**

1. <https://www.udemy.com/course/professional-communication-and-business-writing/> Udemy
2. <https://www.udemy.com/courses/business/communications/> Udemy

**Suggested Online Courses:**

1. Courses on Communication offered by Udemy
2. Business English for Non-Native Speakers Offered by The Hong Kong University of Science and Technology  
[https://www.coursera.org/Specializations/Business English for Non-Native Speakers](https://www.coursera.org/Specializations/Business%20English%20for%20Non-Native%20Speakers)
3. English Communication Skills offered by University of Washington  
[https://www.coursera.org/specializations/Business English Communication Skill](https://www.coursera.org/specializations/Business%20English%20Communication%20Skill)
4. <https://www.udemy.com/share/101wx6/Public> Relations: Media Communication Crisis
5. <https://www.udemy.com/share/101BkA/Basic> English Grammar and Structures

**Reference Books:**

1. Raman Meenakshi and Sangeeta Raman, "Communication Skills", OUP, 2016.
2. Kumar Sanjay and Pushp Lata, "Communication Skills", OUP, 2011.
3. Murphy Herta, "Effective Business Communication", McGraw Hill, 2017.
4. Kitty O Locker, "Business Communication- Building Critical Skills", McGraw Hill, 2013.
5. Lehman, Dufrene, Sinha, "BCOM" Cengage Learning, 2020.
6. K. Alex, "Soft Skills", S.Chand and Company, 2014.
7. Stanton Nicky, "Mastering Communication", Palgrave Master Series, 2009.
8. Alan Pease, "Body Language", Manjul Publications, 2014.
9. A. Kaul, "Effective Business Communication", Prentice Hall of India, 2015.
10. Monippally, "Business Communication Strategies", Tata McGraw Hill, 2001.



**Course Name:** Engineering Mathematics-I

**Course Code:** BS01

**Category:** Basic Science

**Preamble:**

The objective of the course is to impart knowledge of De-Moivre's Theorem, Hyperbolic Functions, and Logarithm of Complex Numbers. The course clarifies the concept of Partial Differentiation and its applications. The course will enable learners to learn different methods of solving improper and Multiple Integral.

**Pre-requisites:**

Basics of Complex numbers and Differentiation & Integration Fundamentals

**Course Objectives:**

- To recall and remember basics of complex numbers, differential calculus and Integral Calculus
- To understand the concepts of basic mathematical methods for Complex Numbers, Partial Differentiation and Multiple Integrals.
- To apply mathematical methods to solve engineering problems
- To solve and evaluate the problems using, complex numbers, Special Functions, Multiple Integrals and differential calculus

**Course Outcomes:**

Learner will be able to:

CO1: Illustrate the basic concepts of Complex Numbers and solve problems involving different forms and properties of complex numbers.

CO2: Apply the knowledge of complex numbers to solve problems in hyperbolic functions and logarithmic function.

CO3: Apply concept of Beta & Gamma functions and DUIS to solve improper integrals.

CO4: Find partial derivatives of multivariable functions and apply Euler's theorem to prove results about Homogeneous functions.

CO5: Apply the concept of partial differentiation to find maxima and minima of multivariable functions.

CO6: Illustrate the concept of Double Integration to evaluate Double Integration in cartesian and polar form.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical & Tutorial
3	-	3	-

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

**Detailed Syllabus:**

Module No.	Module Name	Content	No. of Hours
1	Complex Numbers	Statement of De Moivre's Theorem and related Examples Expansion of $\sin^n \theta$ , $\cos^n \theta$ in terms of sines and cosines of multiples of $\theta$ and Expansion of $\sin n\theta$ , $\cos n\theta$ in powers of $\sin\theta$ , $\cos\theta$ Powers and Roots of complex number	7
2	Hyperbolic function and Logarithm of Complex Numbers	Circular functions of complex number and Hyperbolic functions. Inverse Circular and Inverse Hyperbolic functions. Separation of real and imaginary parts of all types of Functions. Logarithmic functions, Separation of real and Imaginary parts of Logarithmic Functions.	7
3	Special Functions	Beta and Gamma functions with properties Differentiation under integral sign with constant limits of integration (without proof)	7
4	Partial Differentiation & Applications	Partial Differentiation of first and higher order. Differentiation of composite function. Maxima and minima of a function of two independent variables	8
5	Multiple Integration-I	Double integration-Definition, Evaluation of Double Integrals. (Cartesian & Polar) Evaluation of integrals over the given region. (Cartesian & Polar)	8
6	Multiple Integration-II	Evaluation of double integrals by changing the order of integration. Evaluation of double integrals by changing to polar coordinates.	8
<b>Total</b>			<b>45</b>

**Text Books:**

1. Ramana B.V., "Higher Engineering Mathematics", 12<sup>th</sup> edition, Tata McGraw Hill, 2017
2. Seymour Lipschutz, "Beginning Linear Algebra", 6<sup>th</sup> edition, Schaum's outline series, 2012

**Reference Books:**

1. Dr. B.S. Greswal," Higher Engineering Mathematics",9<sup>th</sup> Edition, Khanna Publication,2012
2. Erwin Kreysziq ,"Advanced Engineering Mathematics",9<sup>th</sup> Edition, Wiley Eastern limited ,2012
3. Srimanta Pal and Subidh C. Bhunia," Advanced Engineering Mathematics", UK Edition, Oxford Press,2015
4. H.K. Das," Advanced Engineering Mathematics",17<sup>th</sup> Edition, S, Chand,2008

**Course Name:** Physics

**Course Code:** BS14

**Category:** Basic Science

**Preamble:**

This course introduces learners to the understanding of fundamental principles of Quantum physics specifically concern to Laser, Fibre, Quantum Mechanics, Quantum Computers and their engineering applications. It also provides problem solving experience in semiconductor physics, in both the classroom and the laboratory learning environment. It will motivate the learners through practical examples that demonstrates the role of physics in progress of engineering disciplines, so as to inculcate the interdisciplinary academic environment.

**Pre-requisites:**

Vector Calculus, Differential Equations, Linear Algebra and Basic 12<sup>th</sup> standard Physics

**Course Objectives:**

- Identify and understand the fundamental physical principals underlying engineering devices and processes— a prerequisite to become successful engineers.
- To provide inclusive knowledge of fundamental physical principles encouraging engineering students to venture into the research field.
- To develop scientific temperament for scientific observations, recording, and inference drawing essential for technology studies.
- To give exposure to the topics of fundamental physics in semiconductor and Laser.

**Course Outcomes:**

Learner will be able to:

CO1: Attain the knowledge of Fermi level in semiconductors and applications of semiconductors in electronic devices.

CO2: Understand the concept of thin film technology using interference and diffraction.

CO3: Illustrate the working principle of various lasers and their applications.

CO4: Understand the concepts of optical fibre and its applications in communication system.

CO5: Illustrate the fundamentals of quantum mechanics and its application

CO6: Attain the knowledge of different sensors and its applications.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	2	2	1

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075
Practical	25	-	25	050

**Detailed Syllabus:**

Module No.	Module Name	Content	No. of Hours
01	Semiconductors Physics	Fermi level, Fermi dirac distribution, Fermi energy level in intrinsic & extrinsic semiconductors, effect of impurity concentration and temperature on fermi level, mobility, current density, Hall Effect, Fermi Level diagram for p-n junction (unbiased, forward bias, reverse bias), Semiconducting devices : LED, Solar Cell, Photo diode	6
02	Interference and Diffraction	Interference by division of amplitude, Interference in thin film of constant thickness due to reflected and transmitted light, Wedge shaped film, Newton's rings, Applications of interference - Determination of thickness of very thin wire or foil, refractive index of liquid, wavelength of incident light, testing of surface flatness, Anti-reflecting films and highly reflecting film. Diffraction: Fraunhofer diffraction at single slit, Diffraction Grating, resolving power of a grating, Determination of wavelength of light using plane transmission grating.	6
03	LASER	Spontaneous emission and stimulated emission, metastable state, Population inversion, types of pumping, resonant cavity, Einsteins's equations, Helium Neon LASER, Nd-YAG LASER, Semiconductor LASER, Applications of LASER- Holography	4
04	Fibre Optics	Numerical Aperture for step index fibre; critical angle; angle of acceptance; V number; number of modes of propagation; types of optical fibres; Application: Fibre optic communication system.	4
05	Quantum Physics	De Broglie hypothesis of matter waves; properties of matter waves; wave packet, phase velocity and group velocity; Wave function; Physical interpretation of wave function; Heisenberg uncertainty principle; nonexistence of electron in nucleus; Schrodinger's time dependent wave equation; time independent wave equation; Particle trapped in one dimensional infinite potential well.	6

06	Physics of Sensors	Resistive sensors: Temperature measurement: PT100 construction, calibration, Piezoelectric transducers: Concept of piezoelectricity, use of piezoelectric transducer as ultrasonic generator and application of ultrasonic transducer for distance measurement. Optical sensor: Photodiode, construction and use of photodiode as ambient light measurement and flux	4
<b>Total</b>			<b>30</b>

### Suggested List of Practicals:

1. Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.
2. Determination of refractive index of water using Newton's Ring.
3. Study of Hall Effect.
4. Determination of energy band gap of semiconductor.
5. Study of I/V characteristics of LED.
6. Determination of 'h' using Photocell.
7. Study of I/ V characteristics of semiconductor diode
8. Determination of wavelength using Diffraction grating. (Hg/Na source)
9. Determination of number of lines on the grating surface using LASER Source.
10. Determination of Numerical Aperture of an optical fibre.
11. Determination of wavelength using Diffraction grating. (Laser source)
12. Study of divergence of laser beam.
13. Determination of refractive index of water using Laser source.

### Suggested Online Courses:

1. Exploring Quantum Physics Offered by University of Maryland, College Park  
<https://www.coursera.org/learn/quantum-physics>
2. Physics of silicon solar cells Offered by École Polytechnique.  
<https://www.coursera.org/learn/physics-silicon-solar-cells>
3. Semiconductor Physics Offered by University of Colorado Boulder  
<https://www.coursera.org/learn/semiconductor-physics>

### Text Books:

1. S. Chand Avadhanulu & Kshirsagar- A textbook of Engineering Physics-
2. Dhanpat Rai Publications-Gaur and Gupta ,A textbook of Engineering Physics,

**Reference Books:**

1. B. G. Streetman, Prentice Hall Publisher- Solid State Electronic Devices-
2. S.Chand – Vasudeva-Modern Engineering Physics
3. S. Chand. Brij Lal and Subramaniam- Optics
4. Tata McGraw Hill - Arther Beiser -Concepts of Modern Physics.
5. New Age International Publishers- S. O. Pillai.-A Textbook of Engineering Physics.
6. R Shankar -Principles of Quantum Mechanics
7. S.M. Sze -Physics of Semiconductor Devices

**Course Name:** E-waste and Environment Management

**Course Code:** HS05

**Category:** Humanities, Social Sciences and Management

**Preamble:**

Environmental Education helps learners to understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future. It encourages character building and develop positive attitudes and values.

**Pre-requisites:**

Basics of Environmental Science

**Course Objectives:**

- To introduce the effective mechanism to regulate generation, collection, storage, transport, import, export, recycling, treatment and disposal of e-wastes and their legislative rules.
- This course will help the participants to understand why and how to manage e-waste in an environmentally sound manner and how action on e-waste could be taken in their own life, business, or organization.
- To instigate sustainable practices, green innovations, e-waste recovery and inclusive recycling business models.
- To present innovative research on technological solutions to reduce hazard by design.

**Course Outcomes:**

Learner will be able to:

CO1: Understand need and concept of e-waste management & recycling

CO2: To gain the knowledge of legislative rules and regulations related to E-waste management.

CO3: Recognize the tools and technologies required for e-waste recycling assessment and monitoring.

CO4: Address contemporary issues and analyse the local and global impact of computing and engineering solutions on individuals, organizations, and society

CO5: Apply the knowledge about E-waste management in routine daily life to minimize the hazards.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical & Tutorial
2	-	2	-



**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

**Detailed Syllabus:**

Module No.	Module Name	Content	No. of Hours
1	Overview of E-waste & its management	Introduction, toxicity due to hazardous substances in e-waste and their impacts, domestic e-waste disposal, e-waste management, technologies for recovery of resource from electronic waste, guidelines for environmentally sound management of e-waste, occupational and environmental health perspectives of recycling e-waste in India.	6
2	E-Waste Recycling	Technologies for recovery of resources from electronic waste, resource recovery potential of e-waste, steps in recycling and recovery of materials-mechanical processing, technologies for recovery of materials. Recovery of materials from e-waste, recovery of metals from e-waste	5
3	Exposure pathway of pollutants emitted from Recycling of E-Waste	Environmental and public health issues E-waste health risk assessment	4
4	E-Waste Management Rules of India (2011 and 2016 Rules)	Regulations in India - Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2016 - Salient Features and its likely implication. Government assistance for TSDFs. E-waste Management: Case Studies and Unique Initiatives from around the World The international legislation: The Basel Convention; The Bamako Convention. The Rotterdam Convention. Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union, Restrictions of Hazardous Substances (RoHS) Directive	6
5	Technological Advances to overcome Environmental problems	Concept of Green Buildings, Various indoor air pollutants and their effects on health. Carbon Credit: Introduction and general concept. Disaster Management: Techniques of Disaster Management to cope up with (i) Earthquake and (ii) Flood. Remote sensing and GIS – Introduction and its applications in environment sector	4
6	Environmental Assessment and	Environment Impact Assessment (EIA), Introduction to various symbols, Environmental audit and Eco-labelling, ISO - 14001, 18001 and 31001	5

Module No.	Module Name	Content	No. of Hours
	Management	Pollution Control Legislation- Functions and powers of Central and State Pollution Control Board. Environmental Clearance, Consent and Authorization Mechanism.	
<b>Total</b>			<b>30</b>

**Suggested Online Courses:**

1. Beyond Sustainable Development Goals (SDGs): Addressing Sustainability and Development, offered by University of Michigan - <https://www.coursera.org/learn/beyond-the-sustainable-development-goals-addressing-sustainability-and-development>
2. Environmental Management & Ethics offered by Technical University of Denmark (DTU) - <https://www.coursera.org/learn/environmental-management-ethics>
3. Introduction to Sustainability offered by University of Illinois at Urbana-Champaign- <https://www.coursera.org/learn/sustainability>

**Text Books:**

1. G. Tyler Miller Jr. and Scott Spoolman, "Environmental Science", 13th Edition, Brooks/Cole, 2011

**Reference Books:**

1. Keerthinarayana and Daniel Yesudian, "Environmental Science and Engineering", 1st Edition, Hi-Tech Publications, 2008
2. G.M. Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt Ltd., 2005
3. Anubha Kaushik and C.P. Kaushik, "Environmental Science and Engineering, 3rd Edition, New Age International, 2010
4. Boyle G., "Renewable Energy: Power for a Sustainable Future", Oxford publication, UK 3rd edition, 2012
5. Erach Bharucha, "Text Book of Environmental Studies", Universities Press (India) Pvt. Ltd., 2005
6. Johri R., "E-waste: implications, regulations, and management in India and current global best practices", TERI Press, New Delhi.
7. Krishnamoorthy B., "Environmental Management, Text Book and Cases", PHI Learning (P) Ltd., New Delhi.
8. Electronic Waste Management Rules 2016, Govt. of India, available online at CPCB website.
9. MSW Management Rules 2016, Govt. of India, available online at CPCB website.
10. Hester R.E., and Harrison R.M., "Electronic Waste Management", Science, 2009.
11. Fowler B., "Electronic Waste" – 1st Edition (Toxicology and Public Health Issues), Elsevier, 2017
12. Johri R., "E-waste: implications, regulations, and management in India and current global best practices", TERI Press, New Delhi

**Course Name:** Structured Programming

**Course Code:** ES04

**Category:** Engineering Science

**Preamble:**

To provide exposure to problem-solving by developing an algorithm, flowchart and implement the logic using C programming language.

**Pre-requisites:**

NIL

**Course Objectives:**

- The course aims to provide exposure to problem solving through programming
- It aims to train the students the basic concepts of C programming language
- The course involves lab component to give students hands on experience with the concepts
- It aims to provide exposure to handling data through files

**Course Outcomes:**

Learner will be able to:

CO1: Understand the fundamentals of a programming language.

CO2: Apply the control structures for code optimization and hence improving efficiency.

CO3: Decompose a problem and solve it using modular programming.

CO4: Demonstrate the use of derived and user derived data types for collection and processing of data.

CO5: Understand the concept of pointers and files to solve the problems related to dynamic and persistent data.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical & Tutorial
2	2	2	1

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075
Practical	25	-	25	050

**Detailed Syllabus:**

Module No.	Module Name	Content	No of Hours
1	Fundamentals of C	Character Set, Identifiers and Keywords, Data Types, Constants and Variables Operators, Math Library Functions, Expressions, Pre-processor Directives	4
2	Input and Output	Unformatted and Formatted I/O Function scanf( ) Function printf( ) Concept of Field width, Precision and Flags Basic Programs Based on Computation	2
3	Control Structures	Conditional Branching - if, if-else statement, nested if-else, and switch-case statement. Looping – for loop, while and do-while loop, nested loops Unconditional Branching – break and continue statement	6
4	Functions	Introduction of Functions Declaration and definition of a Function Calling a Function and passing arguments to a Function Concept of Global and Local Variables Storage Classes –Auto, Extern, Static, Register Recursion	6
5	Arrays, Strings and Structures	Array-Concepts, Declaration, Definition, Accessing array element, One-dimensional and Multidimensional array. String- Basic of String, Array of String, Functions in string.h Structure- Declaration, Initialization, Nested structure, Operation on structures, Array of Structure.	6
6	Pointers and Files	Pointer: Pointer Variables, Reference and Dereference Operators, void Pointer, Call by Reference, Pointer Arithmetic, Pointer to Pointer, Pointers and Array, Passing Arrays to Function, Array of Pointers and Dynamic Memory Allocation. Files: Types of File, File operation- Opening, Closing, Creating, Reading, Processing File.	6
<b>Total</b>			<b>30</b>

### Suggested List of practicals

Learners are expected to perform minimum 12 practicals based on the following suggested topics.

Sr. No.	Suggested Topic(s)	Number of Practicals
1	Computation Based Programs	1
2	Programs using if .. else and nested if .. else	2
3	Programs using switch case	2
4	Programs using for loop	3
5	Programs using while loop	2
6	Programs on Functions	2
7	Programs on Recursion	2
8	Programs using 1D and 2D Arrays	3
9	Programs using Strings	2
10	Programs on Structures	2
11	Programs using Call by Reference	1
12	Programs using Dynamic Memory Allocation	1
13	Programs on Files	2

### Text Books:

1. K. R. Venugopal and Sudeep Prasad, "Mastering C", Tata McGraw Hill.
2. Behrouz Forouzan, "A Computer Science –Structure Programming Approaches using C", Cengage Learning.
3. Byron S. Gottfried, "Schaum's outlines Programming with C", Tata McGraw Hill.

### Reference Books:

1. M. G. Venkateshmurthy, "Programming Techniques through C", Pearson Publication.
2. E. Balaguruswamy, "Programming in ANSI C", Tata McGraw Hill Education.
3. Pradeep Day and Manas Gosh, "Programming in C", Oxford University Press.
4. Yashwant Kanetkar, "Let Us C", BPB Publication

**Course Name:** Fundamentals of Computer Hardware and Networking

**Course Code:** ES06

**Category:** Engineering Science

**Preamble:**

Study of computer hardware describes the basic structure of computer system and different ways of communicating with I/O devices and standard I/O interfaces. Network Fundamentals course provides the learners a clear understanding of how computer networks from local area networks to the massive and global Internet are built, how they allow computers to share information and communicate with one another. This course covers the physical aspects of computer hardware and computer network.

**Pre-requisites:**

NIL

**Course Objectives:**

- To introduce physical components and devices of a general-purpose computer
- To provide in-depth knowledge of the functions of different parts of computer
- To focus on balance between access time and cost in storage devices
- To introduce learner with the science of connectivity and networking between computing devices

**Course Outcomes:**

Learner will be able to:

CO1: To understand the organization and architecture of computer systems

CO2: To understand memory management of computer system

CO3: To understand input-output organization

CO4: To introduce concepts and fundamentals of data communication and computer networks

CO5: Understand the concept of different communication medium

CO6: Understand networking concepts with reference to different types of models and topologies, study of different networking device

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical & Tutorial
2	2	2	1

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075
Practical	25	-	25	050

**Detailed Syllabus:**

Module No.	Module Name	Content	No of Hours
1	Fundamentals of computer system	Introduction, Basic organization of computer, Functional block diagram of computer system.	4
2	Memory	Memory hierarchy, Characteristics of memory, Classification of primary and secondary memory, Memory types	5
3	I/O Devices and their interfaces	Common I/O device types and characteristics, Introduction to buses, Introduction to peripheral devices of computer system.	6
4	Types of Networks	Introduction to computer network, network application, network software and hardware components, Features of computer network, types of network architecture (Peer-Peer, Client-Server), Computer Network types (LAN, MAN, WAN), Network Topologies (Bus, Ring, Tree, Mesh, Star, Hybrid), Transmission modes (Simplex, Half-Duplex, Full-Duplex).	6
5	Introduction to wired and wireless Network	Characteristic of wired network, need of wireless network, Introduction to different types of communication medium: Wired and Wireless medium, Wired Transmission Media: Twisted pair, coaxial cable, optical fiber cable, Wireless Transmission: Microwave Links, Satellite communication, Mobile communication, RF communication, Ground wave, Sky wave, space wave, Comparison of wired	5
6	Overview of ISO-OSI layer and Network Devices	Overview of Networking, Need for Networking, Layered architecture, Introduction to ISO-OSI, OSI reference model, TCP/IP Model, Different Network devices used in networking: Hub, Bridge, Switch, Router, Gateway.	4
<b>Total</b>			<b>30</b>

**Suggested List of Practicals:**

Sr No.	Title of Practicals
1	PC assembling and dismantling.
2	Identify motherboard components, RAM identification, removal, installation.
3	Identifying external ports, PC cards and interfacing.
4	Study of RJ45 and CAT6 Cabling and connection using crimping tool
5	Use basic networking commands in Linux (ping, tracer, nslookup, netstat, ARP, RARP, ip, ifconfig, dig, route )
6	Study and understand packet tracer tool
7	Build a simple network topology and configure it using packet tracer
8	Connect the computers in Local area network

**Textbooks:**

1. Ron Gilster, "PC Hardware-A Beginners Guide", McGraw-Hill
2. A.S. Tanenbaum," Computer Networks",4<sup>th</sup> edition, Pearson Education
3. B.A. Forouzan, "Data Communications and Networking", 5<sup>th</sup> edition, Tata McGraw Hill

**Reference Books:**

1. Alan Clements, "Principles of Computer Hardware", 4th edition, Oxford University Press
2. Natalia Olifer & Victor Olifer, "Computer Networks: Principles, Technologies & Protocols for Network Design", Wiley India
3. Larry L.Peterson, Bruce S.Davie, "Computer Networks: A Systems Approach", 2<sup>nd</sup> Edition, The Morgan Kaufmann Series in Networking



## Detailed syllabus of First Year Semester-II

**Course Name:** Professional Skills

**Course Code:** HS02

**Category:** Humanities, Social Sciences and Management

**Preamble:**

The course will groom learners in the areas of developing professional etiquettes, building digital profiles, imbibing workplace ethics, and organizational behavior. This course will also be an essential guide in building business communication and soft skills concepts.

**Pre-requisites:**

Effective Communication

**Course Objectives:**

- To introduce the concepts of the job application process and digital profile building.
- To create awareness of professional etiquettes and corporate culture in tune with 21st Century soft skills.
- To enable learners to enrich their personality through self-awareness and SWOT analysis and understand various interpersonal skills required for the workplace.
- To build the foundations of professional ethics and corporate social responsibility among learners.

**Course Outcomes:**

Learner will be able to:

CO1: Apply the traits of a suitable candidate for a job/higher education, upon being trained in the techniques of holding a group discussion, facing interviews and writing resume.

CO1: Apply the traits of a suitable candidate for a job/higher education, upon being trained in the techniques of holding a group discussion, facing interviews and writing resume.

CO2: Acquire basic proficiency in building a digital profile by demonstrating an awareness of professional and ethical responsibilities.

CO3: Understand the nuances of professional etiquettes and professionalism.

CO4: Enrich their personality through SWOT analysis, identify their personality traits and learning styles

CO5: Develop interpersonal skills to build effective professional relations.

CO6: Demonstrate awareness of contemporary issues, knowledge of ethical responsibilities and CSR.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	2	2	1

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075
Practical	25	-	25	050

**Detailed Syllabus:**

Module No.	Module name	Content	No. of Hours
1	Employment Skills	Job Application & Resume Writing, Group Discussion, Interview Skills, Digital Profile Building (ePortfolio, LinkedIn)	10
2	Professional Etiquettes	Corporate Grooming and Workplace Etiquette, Telephone Etiquette, Netiquettes, Telephone Etiquette, Digital Footprints, Social Media, Personal Profile Privacy	4
3	Interpersonal Skills	Assertiveness, Negotiation, Leadership, Team Building, Problem Solving, Decision Making, Cultural and Emotional Intelligence	6
4	Ethics	Introduction to Ethics, Plagiarism and Online, Plagiarism Checker, Patents, Trademark and Copyrights and GI – Geographical Indicators, Professional Ethics, Corporate Social Responsibility (CSR) –Information Confidentiality	4
5	Personality Enrichment	SWOT Analysis and JOHARI window, Developing Positive Attitude, Personality Types and Learning Styles, Vision and Goal Setting, Stress Management and Time Management	4
6	21 <sup>st</sup> Century Skills	Creative Thinking, Critical Thinking, Collaboration and Communication	2
<b>Total</b>			<b>30</b>

**Suggested List of Practicals:**

1. Icebreakers – Introducing others
2. GD Practice Session
3. Final GD
4. Digital Profiling
5. Role Play on Professional Etiquettes
6. Personality Enrichment
7. Seminar on Interpersonal Skills
8. Case Studies on Ethics

**Suggested List of Assignments:**

1. Draft a Cover Letter and a Resume in response to a job vacancy advertisement (Individual)
2. Role plays and documentation on Professional Etiquettes (Group)
3. Role Play and documentation on Interpersonal Skills (Group)
4. Analysis of case studies on Ethics (Individual)
5. SWOT Analysis (Individual)
6. Assignment on 21st Century Skills (Group)

**Suggested Online Courses:**

1. LinkedIn Mastery: Creating an awesome profile –  
<https://www.udemy.com/course/linkedin-mastery-creating-an-awesome-profile/>
2. Soft Skills: The 11 Essential Career Soft Skills –  
<https://www.udemy.com/course/soft-skills-the-11-essential-career-soft-skills/>
3. Understanding Personality Types at Work –  
<https://www.udemy.com/course/understanding-personality-types-at-work/>
4. Speak English Professionally: In Person, Online & On the Phone –  
<https://www.coursera.org/learn/speak-english-professionally>
5. How to Write a Resume (Project Centered Course)  
<https://www.coursera.org/learn/how-to-write-a-resume>
6. Interviewing and Resume Writing in English Specialization  
<https://www.coursera.org/specializations/english-interview-resume>
7. Build Your Professional ePortfolio in English –  
<https://www.coursera.org/learn/eportfolio-english>

**Reference Books:**

1. Wallace and Masters, "Personal Development for Life and Work", Thomson Learning, 2021.
2. Dr. K.Alex, "Soft Skills", S. Chand and company, 2014.
3. Robbins Stephens, "Organizational Behaviour", Pearson Education, 2016.
4. Dorch, Patricia, "What Are Soft Skills?", Executive Dress Publisher, NewYork, 2013.
5. Francis Peter, "Soft Skills and Professional Communication", Tata McGraw Hill, 2019.
6. Kitty O Locker, "Business Communication- Building Critical Skills", McGraw Hill, Sixth Edition.
7. Chaturvedi and Chaturdevi, "Business Communication - Concepts Cases and Applications", Pearson, 2021.
8. Jones, "How to Speak Fluently", Indian Publishing House, 2021.

**Course Name:** Engineering Mathematics-II

**Course Code:** BS03

**Category:** Basic Science

**Preamble:**

The objective of the course is to impart fundamental knowledge of Rank of Matrix, solve system of linear equations, Eigen values and Eigen Vectors, Caley Hamilton Theorem, find similarity, diagonalization, derogatory and non-derogatory Matrices, n dimensional vector space, Cauchy-Schwarz inequality, Orthogonal Subspaces, and Gram-Schmidt process, Vector Algebra and Calculus including Gradient, Divergence, Curl, Solenoidal and irrotational vector fields.

**Pre-requisites:**

Fundamentals of Matrices and Vectors

**Course Objective:**

- To recall and remember basics of matrices, vectors and transcendental equations
- To apply methods to solve engineering problems.
- To solve and evaluate the problems using Matrices, Vector Spaces and Numerical solutions.
- To analyze problems based on Numerical Methods

**Course Outcomes:**

Learner will be able to:

CO1: Illustrate the concept of rank and rank calculation using various methods.

CO2: Apply the knowledge of rank of Matrix to solve system of linear equations and Solution of system of linear algebraic equations using various methods.

CO3: Apply concept of rank of Matrix to find Eigen Values and Eigen Vectors.

CO4: Apply properties of Matrices to verify Cayley Hamilton Theorem, find similarity, diagonalization, and derogatory Matrices.

CO5: Illustrate the concept and properties of n dimensional vector space, Cauchy-Schwarz inequality, Orthogonal Subspaces, and Gram-Schmidt process.

CO6: Apply Numerical methods to find solution of transcendental equations and system of linear equations.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical & Tutorial
3	-	3	-

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	20	20	60	100

**Detailed Syllabus:**

Module No.	Module Name	Content	No of Hours
1	Matrices	Rank of a Matrix using Echelon forms, reduction to normal form, PAQ forms.	7
2	System of Linear Equations	System of homogeneous and non-homogeneous equations, their consistency, and solutions. Linear dependent and independent vectors.	8
3	Eigen values and eigen Vectors	Characteristic equation, Eigen values and Eigen vectors, properties of Eigen values and Eigen vectors.	8
4	Cayley Hamilton Theorem	Cayley-Hamilton theorem (without proof), examples based on verification of Cayley- Hamilton theorem. Similarity of matrices, Diagonalisation of matrices. Functions of square matrix.	7
5	Vector Spaces	Vectors in n-dimensional vector space: properties, dot product, cross product, norm, Vector spaces over real field, properties of vector spaces over real field, subspaces, The Cauchy-Schwarz inequality, Orthogonality, Subspaces, Gram-Schmidt process.	8
6	Numerical Solutions of Transcendental Equations and System of Linear Equations	Solution of Transcendental Equations: Solution by Newton Raphson method and Regula –Falsi Method. Solution of system of linear algebraic equations, by (1) Gauss Jacobi Iteration Method (2) Gauss Seidal Iteration Method.	7
<b>Total</b>			<b>45</b>

**Textbooks:**

1. Ramana B.V., "Higher Engineering Mathematics", 12<sup>th</sup> edition, Tata McGraw Hill, 2017
2. Seymour Lipschutz, "Beginning Linear Algebra", 6<sup>th</sup> edition, Schaum's outline series, 2012

**Reference Books:**

1. Dr. B.S. Grewal, "Higher Engineering Mathematics", 9<sup>th</sup> edition, Khanna Publication, 2012

2. Erwin Kreysziq ,”Advanced Engineering Mathematics”,9th edition,Wiley Eastern limited ,2012
3. Srimanta Pal and Subidh C. Bhunia ,”Advanced Engineering Mathematics”, UK Edition, Oxford Press,2015
4. H.K. Das,” Advanced Engineering Mathematics”,17th Edition,S,chand,2008
5. Shanti Narayan,”Matrices”,10th Edition,S.Chand,2015
6. S. S Sastry,”Introductory Method of Numerical Analysis”,5th Edition,PHI,2012

**Course Name:** Engineering Graphics

**Course Code:** ES01

**Category:** Engineering Science

**Preamble:**

To improve the visualization skills of the learners, with imparting the learner's ability to read a drawing. This course also imparts and inculcate learners to understand the theory of projection.

**Pre-requisites:**

Basic Geometry

**Course Objectives:**

- To understand the concepts of the Engineering Graphics.
- To know how to use drawing instruments for drafting and dimensioning.
- To understand visualisation technic and skills of Engineering Graphics.
- To know the Construction of 3D object.
- To introduce the tools of Computer Aided drafting (CAD).

**Course Outcomes:**

Learner will be able to:

CO1: Understand conventional method and usage of CAD software.

CO2: Apply the basic principles of projections and visualization to communicate ideas graphically.

CO3: Construct the drawing of curves, points, straight lines, and planes using concept of projections.

CO4: Interpret the three-dimensional pictorial objects and represent in two-dimensional views.

CO5: Construct three dimensional shapes from two dimensional views using the concept of projections.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	2	2	1

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075
Practical	25	-	25	050



**Detailed Syllabus:**

Module No.	Module Name	Content	No. of Hours
1	Introduction to Engineering Graphics and CAD	Introduction and importance of engineering graphics. Introduction of different types of the quadrants, method of projection, lines and dimensioning. Drawing instruments and their usage. Introduction Computer Aided Design and Drafting (CADD or CAD) software and operations, menu system and toolbars.	3
2	Engineering Curve	Basic construction of cycloid, involutes, and helix of cylinder.	4
3	Projection of points, lines	Projections of lines, inclined to both the reference planes HP and VP as per the first angle projection method.	4
4	Projection of Planes	Projection of rectangular, triangular, square, pentagonal, hexagonal, and circular planes, inclined to both the reference planes HP and VP as per the first angle projection method.	4
5	Orthographic Projections	Drawing orthographic views from pictorial projections. Sectional orthographic Projections of a simple machine part as per the first angle projection method. - By drafting in the sketchbook as well as on CAD software. CAD Drawing: Applying dimensions to objects, applying annotations to drawings, setting up and use of layers, changing of the line properties, Printing setup and procedure. Different CAD Tools and usage- Draw tools, modify tools, properties, copy selection, dimensioning and editing (text height and arrow size).	9
6	Isometric Views	Drawing Isometric views from given views of simple blocks with plane, cylindrical surfaces, and circular holes. - By drafting in the sketchbook as well as on CAD software CAD Drawing: Switching to isometric drafting mode, switch /change to different ISO planes, ISO circles on different ISO planes, Different CAD Tools and usage- Draw tools, Modify tools, Properties of line.	6
<b>Total</b>			<b>30</b>

**Suggested List of Practicals:**

Learners are expected to perform minimum 12 drawings based on the following suggested topics, using Computer Aided Design (CAD) tool.

<b>Sr. No.</b>	<b>Suggested Topic(s)</b>	<b>Number of Practicals</b>
1	Orthographic Projection (without section)	4
2	Orthographic Projection (with section)	4
3	Isometric Views	4
4	Problem Based Learning (PBL) on AutoCAD	2

**Text Books:**

1. N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", 53rd Edition, Charotar Publishing House Pvt. Ltd.
2. N.D. Bhatt & V.M. Panchal, "Machine Drawing", 50th edition, Charotar Publishing House Pvt. Ltd.
3. Dhananjay A Jolhe, "Engineering Drawing" 1st edition, Tata McGraw Hill

**Reference Books:**

1. Prof. Sham Tickoo (Purdue University) & Gaurav Verma, "(CAD Soft Technologies): Auto CAD 2012 (For engineers and Designers)", Dreamtech Press New Delhi, 2012
2. "Learning AutoCAD", Autodesk Official Training Guide, 2009

**Course Name:** Object Oriented Programming

**Course Code:** ES05

**Category:** Engineering Science

**Preamble:**

The course aims to advance learner's knowledge in problem solving and programming principles for real world applications through object-oriented programming using Java language. The course emphasizes data abstraction and object-oriented programming design through the implementation of classes, objects and related concept like Inheritance, Polymorphism, Exception Handling, Multithreading and Applets.

**Course Objectives:**

- The course aims to provide exposure to problem solving through object oriented programming
- It aims to train the students the basic concepts of Java programming language
- The course involves lab component to give students hands on experience with the OOP concepts
- It aims to provide exposure to web based application

**Course Outcomes:**

Learner will be able to:

CO1: Apply fundamental Programming Constructs.

CO2: Illustrate the concept of packages, classes, and objects.

CO3: Elaborate the concept of strings, arrays, and vectors.

CO4: Implement the concept of inheritance and interfaces.

CO5: Implement the notion of exception handling and multithreading.

CO6: Develop web based applications.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical & Tutorial
2	2	2	1

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075
Practical	25	-	25	050

**Detailed Syllabus:**

Module no.	Module Name	Content	No of Hours
1	Introduction to Java	Features of Java, Platform Independence – Byte Code, JVM, JRE. Data Types, Operators, Control Structures, Static Data, Static Function, 1D Array and 2D Array	4
2	Object Oriented Programming	Classes and Objects, Instance Variables, Constructors, Object Passing Methods, Method Overloading, Array of Objects	4
3	Inheritance	Concept and Types, Constructors in Inheritance, Method Overriding and Dynamic Method Dispatch, abstract and final keyword, Interfaces – Concept and Significance, Wrapper Classes – String, StringBuffer, Vector	7
4	Exception Handling	Concept of Exception, Types –Checked and Unchecked, Use of throws keyword., try-catch-finally keywords., Throwing Exception manually, User Defined Exceptions	5
5	Multithreaded Programming	Creating Thread – Different Methods, Using Thread Methods, Thread Exceptions, Priorities, Life Cycle of Thread Synchronization	5
6	Packages and Applets	Inbuilt Package, Importing Packages, User Defined Packages, Naming Packages, Advantages of Packages, Applet Basics, Applet Life Cycle, Applet Drawing Methods	5
<b>Total</b>			<b>30</b>

**Suggested List of Practicals**

Learners are expected to perform minimum 12 practicals based on the following suggested topics.

Sr No	Suggested Topic(s)	Number of Practicals
1	Programs on Basic programming constructs like branching and looping	2
2	Program on accepting input through keyboard	2
3	Programs on class and objects	2
4	Program on method and constructor overloading.	2
5	Program on Packages	1
6	Program on 2D arrays, strings functions.	2
7	Program on String Buffer and Vectors.	2
8	Program on types of Inheritance.	1
9	Program on Multiple Inheritance.	1
10	Program on abstract class and abstract methods.	1
11	Program using super and final keyword.	1
12	Program on Exception handling.	2

<b>Sr No</b>	<b>Suggested Topic(s)</b>	<b>Number of Practicals</b>
13	Program on user defined exception.	2
14	Program on Multithreading.	3
15	Program on Graphics class.	2
16	Program on applet class.	2

**Text Books:**

1. Herbert Schildt, "JAVA: The Complete Reference", Oracle Press
2. Sachin Malhotra and Saurabh Chaudhary, "Programming in JAVA", Oxford University Press

**Reference Books:**

1. Ivor Horton, "Beginning JAVA", Wiley, India
2. Dietal and Dietal, "Java: How to program", Prentice Hall
3. Stevan Jolzner, "JAVA Programming- Black Book", Dreamtech Press
4. ScriptDemics, "Learn to Master Java Programming", Staredu Solutions.

**Course Name:** Fundamentals of Logic Circuits

**Course Code:** ES07

**Category:** Engineering Science

**Preamble:**

This course introduces learners to the understanding of fundamental of Number systems, basic analog-digital circuits like diode, BJT, Gates etc. and their applications. It also gives the insights of Boolean algebra. It will motivate the learners to design combinational logic circuits and demonstrates them during practical.

**Pre-requisites:**

Essentials of Physics.

**Course Objectives:**

- To enable learner to recognize numbers in every base
- To express numbers in different coded forms and perform arithmetic operations on them.
- To introduce to BJT as switch, various logic gates and truth tables
- To get acquainted with representation of Boolean expressions, logic diagrams and circuits.

**Course Outcomes:**

Learner will be able to:

CO1: Understand the various Number systems.

CO2: Apply the knowledge of Number system to perform Arithmetic operations.

CO3: Understand basic electronics circuits and their applications.

CO4: Illustrate the working principle of logic gates.

CO5: Apply the knowledge of Boolean algebra for reduction of Boolean function.

CO6: Design and implement various combinational logic circuits.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical & Tutorial
2	2	2	1

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075
Practical	25	-	25	050

**Detailed Syllabus:**

Module No.	Module Name	Content	No of Hours
1	Number System	Introduction to Number systems, Binary Number systems, Signed Binary Numbers, Binary, Octal, Decimal and Hexadecimal number and their interconversion.	4
2	Codes & Arithmetic Operations	Codes: Grey, BCD, Excess-3, ASCII, Parity Code, Hamming Code, Binary arithmetic operations using 1's and 2's complement, BCD addition.	5
3	Basic Electronics Circuits	Diode as a switch, Introduction to Bipolar Junction transistor, C-E configuration, Input output characteristics of BJT, Applications of BJT as a Switch.	5
4	Logic Gates	Logic Gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Implementation of gates using universal gates, Tri-state buffer.	6
5	Boolean Algebra	Theorems and Properties of Boolean Algebra, Standard SOP and POS form, Reduction of Boolean functions using Algebraic method.	4
6	Combinational Circuits	Introduction to combinational circuits, Half Adder, Full Adder, MUX, DEMUX, Encoder, Decoder, Introduction to Flip Flop: SR, JK, D, T (Truth table), Application of Flip-flop as a memory unit.	6
<b>Total</b>			<b>30</b>

**Suggested List of Practicals:**

Sr No.	Suggested Topic(s)
1.	To verify truth table of different logic gates.
2.	Implement Ex-OR using NAND & NORgate.
3.	To design Binary to gray and Gray to binary code convertor using logic gates.
4.	Reduction of the Boolean expression using Boolean laws & realize it using basic gates.
5.	Design and implement half adder & full adder using logic gates.
6.	Design and implement half subtractor & full subtractor using logic gates.
7.	Design and implement 2:1 MUX using logic gates.
8.	Design and implement 2:1 DEMUX using logic gates.
9.	Realization of logic function using Multiplexer.
10.	Truth table verification of Flip-flops.

**Textbooks:**

1. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill.
2. Donald A. Neamen, "Electronic Circuit Analysis and Design", 2<sup>nd</sup> Edition, TATA McGraw Hill.

**Reference Books:**

1. M. Morris Mano, "Digital Logic and computer Design", PHI.
2. Robert L. Boylestad, Louis Nashelsky, "Electronic devices and circuit Theory", PHI.
3. Donald P Leach, Albert Paul Malvino, "Digital Principals & Applications", TATA McGraw Hill.



## Detailed Syllabus of General Education Courses

**Course Name:** Design Thinking

**Course Code:** GE01

**Category:** General Education

**Preamble:**

Design thinking is a powerful tool for rethinking and revitalizing strategy—and for driving organizational performance. By placing customers' needs at the center of a product, service, process, or business model, you can reframe strategic challenges and develop more effective solutions. Drawing on right-brained creativity and left-brained analytics, the course on design thinking enables you to broaden your strategic perspective, find novel opportunities for innovation, and keep your business moving forward.

**Course Objectives:**

- To impart knowledge on the concepts of Design Thinking
- To impart knowledge on the phases of Design Thinking
- To apply Design Thinking concepts

**Course Outcomes:**

Learner will be able to:

CO1: Understand the concepts of design thinking approaches

CO2: Create design thinking teams and conduct design thinking sessions

CO3: Apply both critical thinking and design thinking in parallel to solve problems

CO4: Apply design concept to their daily work

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Tutorial	Theory	Tutorial
2	2	2	1

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075
Tutorial	50	-	-	050

**Detailed Syllabus:**

<b>Module No.</b>	<b>Module Name</b>	<b>Content</b>	<b>No of Hours</b>
1	Design Thinking Overview	What is different about design thinking, Design thinking skills, Design thinking mindset, Principles of Design thinking	2
2	General Approaches to Design Thinking	The basics of Design thinking, Design thinking frameworks, Design thinking team, Design thinking workshops and meeting – Characteristics and types	4
3	Design Thinking approach in stages	Apply design thinking framework, empathize with customers/users, Define the problem, Ideate, Prototype, Test solution.	7
4	Design Thinking Techniques	Listening and emphasizing techniques – Engagement, Observation, showing empathy, Define and ideation techniques – Unpacking, Personas, Pattern recognition and connecting the dots, Prototype, and testing techniques – Types of prototypes, forms of testing in design thinking,	7
5	General Design Thinking Practices	Use of diagrams and maps in design thinking – empathy map, affinity diagram, mind map, journey map. Story telling techniques – Improvisation, scenarios, K-scripts	8
6	Adopt and Adapt Design thinking	Cautions and pitfalls – assumptions, pitfalls and cautions in design thinking workgroups, Best practices	2
<b>Total</b>			<b>30</b>

**Reference Books:**

1. Tim Brown, "Change by Design - How Design Thinking Transforms Organisations and Inspires Innovations"
2. Larry J.Leifer, Michael Lewerick, and Patrick, "The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods"

**Course Name:** Indian Constitution

**Course Code:** GE06

**Category:** General Education

**Preamble:**

This course introduces learners to the framework that demarcates fundamental political code, structure, procedures, powers, and duties of government institutions and sets out fundamental rights, directive principles, and the duties of citizens.

**Pre-requisites:**

NIL

**Course Objectives:**

- To understand what a constitution is and why it is necessary
- To understand how the constitution, embodies certain ideals
- To understand importance of fundamental rights and fundamental duties
- To understand the functioning of the Parliament.

**Course Outcomes:**

Learner will be able to:

CO1: Learner will be able to understand constitution principles

CO2: Learner will be able to co-relate with political system

CO3: Learner will be able to pursue the values of civic life

CO4: Learner will be able to exercise their rights and duties

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

**Examination Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

**Detailed Syllabus:**

Module No.	Module Name	Content	No. of Hours
1	Introduction	Historical background of constitution, Philosophy of constitution	3
2	Citizenship	Citizenship at the commencement of the Constitution, Rights of citizenship of certain persons of Indian origin residing outside India, Persons voluntarily acquiring citizenship of a foreign State not to be citizens, Continuance of the rights of citizenship, Fundamental Duties	4
3	Fundamental Rights	Definition, Laws inconsistent with or in derogation of the fundamental rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Core issues (Uniform civil code, Article 370, Reservation)	4
4	Directive Principles of State Policy	Definition, Certain principles of policy to be followed by the State, Equal justice and free legal aid, Organisation of village panchayat, Right to work, to education and 10 public assistance in certain cases, Provision for just and humane conditions of work and maternity relief, Living wage, etc., for workers, Participation of worker; in management of industries, Uniform civil code for the citizens, Provision for free and compulsory education for children, Promotion of educational and economic interests of Scheduled Castes, Scheduled Tribes and other weaker sections, Protection and improvement of environment and safeguarding of forests and wild life, Protection of monuments and places and objects of national importance, Separation of judiciary from executive, Promotion of international peace and security	4
5	The Parliament	Constitution of Parliament, Composition of the Council of States, Composition of the House of the People, Duration of Houses of Parliament, Rights of Ministers and Attorney-General as respects Houses, Law making procedure, Amendment process and language	4
6	Judiciary	Establishment and Constitution of Supreme Court, High Courts for States, Subordinate Courts, Working of quasi – judicial bodies	4
7	Elections	Superintendence, direction and control of elections to be vested in an Election Commission, Power of Parliament to make provision with respect to elections to Legislatures, Power of Legislature of a State to make provision with	4

		respect to elections to such Legislature Bar to interference by Courts in electoral matters	
8	Landmark cases	Nanavati case, Shah Bano, Keshvanand BhartiVishakha Case etc	3
<b>Total</b>			<b>30</b>

**Recommended Online Courses:**

1. Constitutional Studies  
[https://onlinecourses.nptel.ac.in/noc20\\_lw03/preview](https://onlinecourses.nptel.ac.in/noc20_lw03/preview)
2. Constitution of India  
<https://www.udemy.com/course/constitution-of-india/>

**Reference Books:**

1. D.C. Gupta, "Indian Government and Politics"
2. D.D. Basu, "Introduction to the Constitution of India"
3. P. M. Bakshi, "The Constitution of India"
4. M. V. Pylee, "Constitutional History of India"

**Course Name:** Universal Human Values

**Course Code:** GE07

**Category:** General Education

**Preamble:**

The present education system has become largely skill-based. The prime emphasis is on science and technology. However, science and technology can only help to provide the means to achieve what is considered valuable in terms of facilities. Value Education is a crucial missing link in the present education system. Because of this deficiency, most of our efforts may prove to be counterproductive and serious crises at the individual, societal and environmental level are manifesting.

Values and skill complement each other. Values mean importance or participation and skills mean qualities, training, and capabilities. To fulfil our aspirations both values and skills are necessary. When we identify and set the right goals and produce in right direction, this is known as value domain, the domain of wisdom. Basically, we must know what really is useful to achieve human happiness, the happiness to all and for all the time.

And when we learn and practices to actualize this goal to develop the techniques to make this happen in real life, in various dimensions of human Endeavour, this is known as domain of skills. Hence, there is an essential bonding between values and skills for the success of any human endeavor.

For a happy and successful life, it is important to know, explore, verify and practice universal human values, professional ethics.

**Prerequisite:**

NIL

**Course Objective:**

- To help the student to see the need for developing a holistic perspective of life.
- To sensitize the student about the scope of life – individual, family, society and nature/existence.
- Strengthening self-reflection.
- To develop more confidence and commitment to understand, learn and act accordingly.

**Course Outcomes:**

Learner will be able to:

CO1: Learner will become more aware of themselves and their surroundings.

CO2: Learners will be more responsible in life and will able to handle critical problems.

CO3: Learners will develop better critical ability.

CO4: Learners will be more sensible towards commitment.

CO5: Learner will be able to apply human values in day to day life.

CO6: Learner will become a responsible citizen.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical & Tutorial
2	-	2	-

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

**Detailed Syllabus:**

Module No.	Module Name	Content	No. of Hours
1	Introduction to Value Education	Need for Value Education Basic Guidelines for Value Education The Content of Value Education The Process of Value Education Starting to observe inside What is Self-exploration? What is its Purpose? Content of Self-exploration Process of Self-exploration Natural Acceptance What is the State today? What is the way out? What do we need to do?	5
2	The Basic Human Aspirations Continuous Happiness and Prosperity	Continuous Happiness and Prosperity Our Basic Aspirations Exploring Happiness and Prosperity A Look at the Prevailing Notions of Happiness and Prosperity Some Possible Questions/Confusions Basic Requirements for Fulfilment of Human Aspirations What is our State today? Why are we in this State? - Living with Wrong Assumptions What is the Solution? The Need for Right Understanding Our Program: Understand and Live in Harmony at all Levels of Living Our State today Our Natural Acceptance for Harmony at all Levels of our Living Human and Animal Consciousness	5
3	Understanding the Human Being as	Human Being is more than just the Body	5



	<p>Co-existence of Self ('I') and Body</p>	<p>Understanding Myself as Co-existence of the Self and the Body          Understanding Needs of the Self and Needs of the Body          Understanding the Activities in the Self and the Activities in the Body          Understanding the Self (I) as the Conscious Entity, the Body as the Material Entity          Exercise on distinguishing Needs of the Self ('I') and Body          Exercise on Distinguishing Activities of the Self (I) and Body          Understanding the Body as an Instrument of 'I' (I' being the Seer, Doer and Enjoyer)          Why should I study Myself?          Getting to know the Activities in the Self (I)          How are the Activities in T Related!          The Activities in 'I' are Continuous          Effects of the Problem....          What then is the Solution?          Result of Realization and Understanding Living with Definiteness          Our Body A Self-organized Unit          Harmony of T with the Body: Sanyama and Svasthya          What is our State today?          What is the way out?          Understanding and Living with Sayama          Correct Appraisal of our physical needs</p>	
<p style="text-align: center;">4</p>	<p>Harmony in the Family, Society, Nature-          Understanding Values in Human Relationships</p>	<p>Family as the Basic Unit of Human Interaction          Harmony in the Family.          Justice (Nyaya)          What is the State today?          Values in Human Relationships          Trust (Visvasa)          Respect (Sammana          The Basis for Respect          Assumed Bases for Respect Today          The Problems due to Differentiation          Difference between Attention' and 'Respect'          What is the way out?          Affection (Sneha)          Care (Mamand)          Guidance (Vatsalya)          Reverence (Shraddha)          Glory (Gaurava)          Gratitude (Kritagayta)</p>	<p style="text-align: center;">5</p>

		<p>Love (Prema) Harmony from Family to World Family: Undivided Society Extending Relationship from Family to Society Identification of the Comprehensive Human Goal Where are we today? Programs Needed to Achieve the Comprehensive Human Goal: The Five Dimensions of Human Endeavour Education-Right Living (Siksha Sanskara) Health-Self-regulation (Svasthya-Sanyama) Justice-Preservation (Nyaya-Suraksha) Production-Work (Utpadana-Karya) Exchange-Storage (Vinimaya-Kosa) What is our State today? Harmony from Family Order to World Family Order: Universal Human Order The Four Orders in Nature Interconnectedness and Mutual Fulfilment (Parasparta aur Paraspara Purakata) Recyclability and Self-regulation in Nature Understanding the Four Orders Things (Vastu) Activity (Kriya) Innateness (Dharana) Natural Characteristic (Sabha) Basic Activity Conformance Human Beings-our State today What is way out</p>	
5	Implications of the Right Understanding	<p>Values in Different Dimensions of Human Living Universal Values naturally emerging from the Right Understanding Definitiveness of Ethical Human Conduct Identification of Sname leading to Svatantrata and Swarajya Development of Human Consciousness Implications of Value-based Living Identification of Comprehensive Human Goal Vision for the Holistic Alternative Basis for Humanistic Education and Humanistic Constitution Universal Human Order and its Implications</p>	5
6	Professional Ethics Journey towards	<p>Profession-In the Light of Comprehensive Human Goal Ensuring Competence in Professional Ethics- The current Scenario</p>	5

	the Holistic Alternative	Inherent Contradictions and Dilemmas and their Resolution Appreciating the Need for Self-Exploration Facilitating the Understanding of Harmony at various Levels Steps for Evolution at the Individual Level Steps for Transition at the Level of Family Society and Profession Promoting Mass Awareness and moving towards Humanistic Education Evolving Holistic Models of Living Amending Policies, Programs and Social Systems in tune with Comprehensive Human Goal Is the Transition too Difficult? Concluding Remarks	
<b>Total</b>			<b>30</b>

**Reference Books:**

1. A Foundation course in Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria Excel books.

**Course Name:** Indian Traditional Knowledge Systems

**Course Code:** GE08

**Category:** General Education

**Preamble:**

India has a vast tradition of Sanskrit texts dealing with various scientific thoughts. Number of treatises on the topics like Agriculture, Animal Husbandry, Chemistry, Astronomy, Mathematics, Botany, etc. focus on the development of thoughts in the concerned area.

This course aims at introducing a student with various treatises on physical as well as social sciences and their contribution to modern branches of sciences. Taking into consideration the vast scope of these sciences, major treatises will be introduced in the course thereby making a student to ponder over the ancient knowledge systems of India.

**Pre-requisites:**

NIL

**Course Objectives:**

- The objective of this course is to facilitate the learners with the concepts of Indian traditional knowledge and to make them understand the importance of roots of knowledge system.
- It aims at imparting basic principles of thought process, reasoning and inference

**Course Outcomes:**

Learner will be able to:

CO1: Understand and the rich history of Indian knowledge system

CO2: Understand the different areas of contribution from India

CO3: Apply the different principals of traditional knowledge in modern systems

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical & Tutorial
2	-	2	-

**Evaluation Scheme:**

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

**Detailed Syllabus:**

<b>Module No.</b>	<b>Module name</b>	<b>Content</b>	<b>No of Hours</b>
1	Review of Scientific Literature in Sanskrit	References of sciences/scientific knowledge through different textual sources etc.	6
2	Chemistry and Mathematics	Various treatises on Chemistry, Use of chemistry in medicines, Metallurgy, Use of chemistry for occult practices, Mathematical concepts through Shulbasutras, Development of different mathematical branches and treatises based on that, Development of astronomy, etc.	15
3	Dietetics	Study of different texts based on culinary art Nalapakadarpana, Bhojanakutuhalam, Supashastra, Modes of preservation of food, Dietary guidelines through branches of Ayurveda, Food and diseases, etc.	5
4	Agriculture, Astronomy, and Zoology	Study of krishisuktas, Krishiparashara, Brihatsamhita, Types of crops, Manures, Types of land- devamatruka, nadimatruka, Indian Astronomy, Use of animals in warfare, Animal husbandry, Animals for medicines, etc.	4
<b>Total</b>			<b>30</b>

**Reference Books:**

1. Nirmal Trikha, "Scientific Knowledge in Sanskrit Literature"
2. S. Balachandra Rao, "Indian Astronomy: An Introduction"
3. B. Seal, "Ancient Indian Sciences"
4. Melissa Stewart, "Science in Ancient India (Science of the Past)"
5. Sudheer Birodkar, "India's Contribution to World Culture"
6. R. C. Majumdar, "Ancient India"
7. Swami ChidatmanJee Maharaj, "Ancient Indian Sciences"
8. Stella Kramrisch, "The Art of India through the Ages"
9. K.Krishna Murthy, "Early Indian Secular Architecture"

### Appendix A

#### List of courses under General Education (GE) Category

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
1	GE01	Design Thinking	2	-	1	3	2
2	GE02	Social Service Internship/ Project	-	6	-	3	3
3	GE03	Internship with other Institutes (Credit Transfer)	2	4	-	4	SE Break
4	GE04*	Wellness – Body, Mind & Spirit	1	2	-	2	Any
5	GE05*	Basics of Finance & Legal aspects for Business	2	-	-	2	Any
6	GE06*	Indian Constitution	2	-	-	2	Any
7	GE07*	Universal Human Values	2	-	-	2	Any
8	GE08*	Indian Traditional Knowledge System	2	-	-	2	Any
9	GE09*	Corporate and Social Etiquettes	2	-	-	2	Any
10	GE10*	Global Citizenship Education	2	-	-	2	Any

**Note:**

**GE01, GE02 and GE03 are mandatory and will be offered by the department as per the programme scheme.**

**\*A subset of courses from GE04 to GE10 shall be offered against GEXX\* (recommended to be taken in Semester 1,2 and 3 of B.Tech. Information Technology programme). However, the subset will depend on the GE courses made available by the Institute for that semester.**