Swarrnim Startup & Innovation University
Swarrnim Institute of Technology
B.Tech Computer Engineering
Cross-Cutting Issues

SEMESTER-I					
Sr. No.	**Course Name**	**Human Values**	**Professional Ethics**	**Gender Sensitization**	**Environment Sustainability**
1	MATHS-I	Row operations, solving systems, inverse of matrices	Convergence and divergence of improper integrals	Row operations, solving systems, inverse of matrices	Power Series, Convergence, Divergence, Taylor/Maclaurin Series; Optimization, Euler's theorem, Jacobian
2	ELEMENTS OF MECHANICAL ENGINEERING	Refrigeration & Air Conditioning, Internal Combustion Engines	Material Handling	-	Properties of Gases & Steam, Pumps & Air Compressors
3	FUNDAMENTALS OF COMPUTER PROGRAMMING	Basic block diagram, hardware/software, logic building, flowcharts	Control Structures (if-else, switch, loops)	Functions and Recursion	File Management
4	ENVIRONMENTAL STUDIES	Definition, Scope, and Importance of Environmental Studies Need for Public Awareness Role of an Individual in Prevention of Pollution People in Environment Pollution Case Studies	Overexploitation of Natural and Energy Resources Solid Waste Management Practices Industrial Impact on Forests and Water Resources Ethical Use of Non-renewable Resources	Access to Clean Water and Sanitation Impact of Pollution on Women and Children Role of Women in Environmental Conservation Public Awareness and Inclusive Participation	Renewable and Non-renewable Resources Water, Forest, and Energy Resource Management Ecosystem Structure, Function, and Cycles Food Chains, Food Webs, Ecological Pyramids Major Ecosystems: Forest,

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			Pollution Control Responsibilities		Grassland, Desert, Aquatic, Estuarine Air, Water, Soil, Marine, Noise, Thermal Pollution Nuclear Hazards Urban and Industrial Waste Management
5	ORIENTATION PROGRAM IN START-UP AND ENTREPRENEURSHIP	Entrepreneurial Characteristics and Personality Traits; Motivation for becoming an Entrepreneur	Issues & Problems in Entrepreneurial Practices	Entrepreneurial Characteristics	Opportunity Identification
6	ELEMENTS OF ELECTRICAL ENGINEERING	Safety precautions in handling electrical appliances, First aid for electric shock, Other hazards of electrical laboratories & safety rules, Importance of grounding and earthing	Safe disposal of Batteries	Illumination schemes for domestic & commercial premises	Fuel cell: Principle & Types, Power factor improvement, Energy stored in magnetic fields
7	ELECTRICAL WORKSHOP	Electrical safety tools, Electrical safety rules, Use electronic workshop tools for building and wiring electronic circuits with necessary safety	I.E. rules for electrical hazards and accidents	-	Undertaking pipe earthing, plate earthing
SEMESTER-II					
1	ENGINEERING PHYSICS	Sound insulation, Reverberation, Absorbing materials, Communication and Industrial applications,Applications of	Noise control in machines, Applications: SQUID, Josephson effect,Spontaneous vs stimulated emission,	Inclusive digital connectivity,Medical applications (e.g., LASIK, cosmetic lasers),	Noise pollution,High-temperature superconductors, Maglev trains,Advantages (low power loss), TIR,Applications

		ultrasound in Medicine & Industry	Optical Resonators,Applications in Communication,Use in electrical insulation and safety systems		in Capacitors, Transformers,Magnetic storage, Soft/Hard materials,Surface effects, Nano-toxicity, Synthesis methods,Energy-efficient devices using p-n junctions, low-power design
2	COMMUNICATION SKILLS	Need for Effective Communication, Definition & Types of Communication, Better understanding among individuals and group, Importance of clear expression and active listening	Importance of English as Second Language, Importance, Types and Mood of Communication ,Ethical dissemination of ideas	Importance of Communication, Kinesics (Body Language), Inclusive interaction regardless of background	Communication for awareness on global issues (optional)
3	BASIC ELECTRONICS	CRO: front panel controls and application	Analog and digital multimeter, RJ-45, RS-232, HDMI connectors, Coaxial cable connectors	-	Fiber optic cable, CMOS Logic Family
4	MATHS-II	Isomorphisms, Matrix Representation,Orthonormal Bases, Linear Transformations, Cylindrical Shells	Least Squares,Volumes, Slicing Method , Properties of Double Integrals	Vector Spaces, Linear Algebra, Integration, Orthogonal Complements, Dot Product & Inner Product	Triple integrals in cylindrical/spherical coordinates,Volume of solids,Least Squares Approximation,Application: Quadratic Forms
5	ENGINEEERING GRAPHICS	Visualization Skills	BIS Standards	-	Sectional Views & Projections
6	BASIC PROGRAM IN ENTREPRENURESHIP	Idea Generation Techniques	Feasibility Analysis	-	Idea Generation and Business Models that solve eco-sensitive problems
7	CHEMISTRY	Green Chemistry,BIS Standards for drinking	Types of Bonds & Organic Molecules, Flue gases	Water treatment methods, Biopolymers (Cellulose,	Water impurities & Hardness, Alternative fuels

		water, Corrosion Theories , Principles of Green Chemistry , Selection of lubricants	analysis – Orsat, Industrial Applications	Starch),Primary & Secondary Cells	(CNG, LNG, Bio-diesel), Metal Protection Techniques
SEMESTER-III					
1	DIGITAL ELECTRONICS	Basic difference between Combinational logic and Sequential logic	Binary code, excess-3 code, gray code, error detection and correction codes.TTL, CMOS, electrical characteristics,	-	Logic Families (TTL, CMOS), A/D & D/A Converters, interface with different logic families
2	COMPUTER NETWORK	-History and purpose of networks emphasize their role in connecting people. -Applications (email, web) facilitate human collaboration and reduce barriers.	-Respect privacy and data confidentiality at Application Layer. -Fair routing, no discrimination (aligns with net neutrality principles).	-Although syllabus content is technical, teaching and labs should actively ensure inclusion, participation, and accessibility for all genders. -Promote awareness that technology impacts everyone — and designs should be inclusive.	-History of networks replacing physical mail, travel. -Efficient LAN and routing minimize hardware, cabling, and power consumption. -Digital apps reduce paper usage, conserving natural resources.
3	DATA STRUCTURE AND ALGORYTHM	-Focus on fairness & optimality in resource allocation (Queues, Trees, Greedy & Dynamic Programming problems). -Systematic, patient problem solving (Divide & Conquer).	-Avoid misrepresentation of algorithmic capabilities. -Fair and equitable resource allocation in scheduling & knapsack problems. -Transparent reporting of performance, correctness.-	-Use inclusive examples & team projects. -Address stereotypes by showcasing contributions of all genders in algorithms & computer science history.	-Efficient algorithms reduce energy & memory consumption. -Huffman coding, MST, and optimal job scheduling save computational & physical resources. -Promote sustainability by encouraging eco-friendly computational practices.
4	DATABASE MANAGEMENT SYSTEM	-Trust, fairness, and accuracy in managing shared information. -Systematic design	-Uphold data privacy, integrity, and correctness. Avoid misuse of DB capabilities (e.g.,	-Design schemas, queries, and business rules that are inclusive and do not embed gender bias.	-Centralized DBs reduce paper records, saving physical resources. Normalization & efficient

		(normalization, integrity constraints) reflects a commitment to quality & societal good. Transaction reliability & recoverability align with dependability.	unauthorized triggers, unfair locking). -Respect user consent & transparent operations (especially in transactions & views).	-Use lab work & examples that are sensitive and balanced. -Views & access control can protect vulnerable users (e.g., privacy-sensitive applications).	queries minimize storage & energy use. -Transaction & concurrency optimization reduce processing overhead, conserving power.
5	MATHS- III	Fourier Series and Fourier Integral, ODEs and Applications, Basic PDEs, Method of Separation of Variables, Power Series Method, Differentiation and Integration of Transforms	Laplace Transforms and Applications,Dirac's Delta Function, Fourier-Bessel Series, Rectangular and Circular Domains	-	Convolution and Integral Equations, Fourier-Bessel Series, Rectangular and Circular Domains, PDEs in Vibrating Strings, Membranes, Heat Conduction
6	Foundation Program in Entrepreneurship	Ethical fundraising methods	Fundraising method; Financial reporting and accuracy; Government schemes and compliance		Government schemes like Atal Innovation Mission, Make in India
SEMESTER-IV					
1	Object Oriented programming with C++	-Responsibility, modularity & maintainability reflect respect for others' time & effort. -Encapsulation & inheritance demonstrate respect for boundaries & structure.	-Avoid misuse of features like friend functions or pointers that compromise privacy or security. -Transparent, maintainable coding practices uphold professional ethics.	-Choose inclusive and neutral examples (e.g., avoiding gender-stereotypical object names or scenarios). -Ensure examples and assignments are accessible to all learners equally.	-Modular & reusable code conserves computational resources. -Efficient file handling & optimized execution reduce energy consumption. -Use of STL and templates reduces redundant implementations, saving memory & processing cycles.
2	Operating System	-Fairness in process scheduling & memory allocation. -Collaboration through IPC &	-Do not misuse OS features (e.g., system calls, driver manipulation) to harm. -Ensure privacy & data	-OS design, administration tools, and case studies should cater to diverse user needs. -Encourage inclusive	-Virtualization, efficient scheduling & memory management conserve resources.

		open-source principles. -Awareness of limits (deadlocks, fragmentation) and responsible resolution.	integrity through file and memory protections. -Respect licensing (Linux/Windows) and transparent practices.	participation in labs & shell scripting.	-Linux/open-source encourages longer hardware use & reduces environmental impact. -Optimized storage/file systems save physical media & power.
3	SystemSoftware	-SE emphasizes responsibility, reliability, and service to society. -Agile & teamwork promote mutual respect & cooperation. -Risk management & clear documentation reflect accountability.	-Truthfulness in estimations, metrics, and SRS. Respect user privacy, intellectual property, and team contributions. -Avoid misuse of system-level tools and features.	-Requirement engineering & tools should capture diverse user needs. -Inclusive team practices in agile & project management. -Documentation & tools designed for broad accessibility.	-Agile & iterative models reduce wasted effort. -Efficient systems & tools minimize energy and hardware resource usage. -Reusable components, modularity, and optimization save resources.
4	Web Technology	-Web design that is accessible & easy to navigate reflects empathy & inclusivity. -Validations, feedback, and navigation designed to help users.	-Respect intellectual property (code, content, libraries). -Transparent and honest web publishing practices.	-Avoid bias in form labels, content, and media. -Database schemas & forms should accommodate diverse identities.	-Optimize web pages (lightweight code, compressed images) to reduce bandwidth. -Responsive & modular designs extend hardware usability for clients.
5	MATHS-3	-Respect for structure, order, and systematic problem solving. -Responsibility in modeling & solving problems that impact society (heat, vibrations, etc.). -Perseverance in applying	-Transparent communication of results & assumptions. -Avoid overclaiming accuracy of approximate methods. -Credit original methods/theories where due.	-Use inclusive examples (e.g., modeling both male/female population growth equally). -Ensure equal opportunity in practice, labs, and discussions. -Encourage diversity in mathematical modeling contexts.	-Fourier & PDE methods model natural and environmental systems (heat flow, sound waves, pollution dispersion). -Mathematical tools enable design of more sustainable technologies and resource use.

		advanced mathematical tools.			
6	Intermediate Program in Entrepreneurship	Design Thinking; Business Presentation Skills and Negotiation ethics	Business Ethics and Legal Issues, Company Formation Procedure	-	Product Lifecycle; Marketing of sustainable products
SEMESTER-V					
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7	Electronic Workshop	Electrical safety tools, Electrical safety rules, Use electronic workshop tools for building and wiring electronic circuits with necessary safety	I.E. rules for electrical hazards and accidents	-	Undertaking pipe earthing, plate earthing
SEMESTER-VI					
1	Wireless Network	-Equitable access to cloud services. -Responsibility in resource sharing & security. -Standards and compliance reflect care for users & society.	Transparent use & billing of cloud resources. -Respect privacy, confidentiality, and intellectual property. -Avoid exploiting vulnerabilities or hoarding resources.	-Inclusive identity & access management. Design cloud services and interfaces that cater to all users without bias. Support diversity in administrative & end-user roles.	Shared infrastructure & virtualization reduce hardware footprint & energy consumption. Cloud enables remote work & reduces travel-related emissions. Optimized data centers save electricity & minimize waste.
2	Cloud Computing	Promotes democratized access to technology and responsible use of shared cloud resources., - Addresses equitable cloud service provisioning and management across different regions and sectors. - Ensures mobile users across demographics gain access to cloud services, supporting inclusion and digital well-being.	E- thical management of service reliability, uptime promises, and risk mitigation. - Ensures alignment with data laws, regulations and ethical data storage. -Critical focus on ethical responsibilities for protecting user data and ensuring confidentiality.	- Protects identity and privacy of users, which is crucial for women and marginalized gender groups in online ecosystems. - Prevents exploitation or breaches that could disproportionately affect vulnerable user groups. -Addresses digital divides and ensures inclusive access to cloud services across devices and regions.	- Enables efficient use of hardware, reduces energy waste, and supports green computing. -Focuses on optimal cloud structure for minimizing redundancy and energy use. - Promotes lightweight, efficient mobile-cloud systems, reducing carbon footprint and bandwidth use.
3	Data Mining and Warehousing	- Encourages clean, fair, and accurate data handling to support informed decisions.	-Addresses responsible use of predictive analytics and AI.	- Human-centric data refinement ensures inclusive representation.	- Encourages efficient data storage and query handling, minimizing server loads.

		- Promotes structured and transparent knowledge discovery for societal good. - Enables responsible storage, retrieval, and sharing of large-scale data.	- Ensures ethical storage, privacy preservation, and data protection practices. - Raises ethical questions around behavioral tracking and profiling using data.	- Can be used to reduce or detect gender bias in training datasets. - Can provide demographic analysis, enabling inclusive policy-making and reporting.	- Promotes optimal use of storage and compute, reducing energy consumption. - Efficient algorithms help reduce computational overhead and energy use.
4	Advance JAVA	- Promotes collaboration, responsible communication, and understanding of client-server interactions in society. -Instills responsibility in managing and accessing data accurately and securely. -Encourages accountability in designing secure and user-friendly web applications. - Promotes creativity, integrity, and responsibility in UI/UX content delivery. -Fosters professional responsibility and teamwork in building enterprise-grade applications.	Emphasizes ethical data handling, user privacy, secure session management, and responsible use of digital resources.	Ensures equal access to web and backend technologies, promoting inclusive and gender-neutral learning.	Encourages digital transformation, reducing paper usage and carbon footprint in communication and records.
5	Compiler Design (23040602)	-Responsibility & service through systematic, reliable compilation. -Supportive error recovery to help users succeed. -Logical, transparent processes reflecting fairness.	-Avoid plagiarism, malicious code generation, or hiding vulnerabilities. -Truthful documentation & error reporting. -Respect intellectual	-Use inclusive examples & language. -Ensure compiler tools support diverse languages & scenarios benefiting all.	-Efficient lexical & parsing processes minimize CPU cycles. -Optimized code & memory management reduce energy & system resource consumption.

			property in compiler designs.		-Eco-friendly compiler designs through faster, leaner processes.
6	Expert Program in Entrepreneurship	Succession Planning	Franchising, Licensing, Joint Ventures, M&A – legal and ethical considerations	Equal opportunity in succession planning	Product development and diversification strategies
SEMESTER-VII					
1	Artificial Intelligence	Applications of AI - Natural Language Processing (NLP) - AI in Expert Systems and Decision Making	- Expert System Architecture & Uncertainty - Knowledge Representation & Reasoning - AI Search Algorithms (A*)	- NLP (Discourse & Pragmatics) - AI Applications in Language and Social Media - Project Work with inclusive use-cases	- Simulated Annealing - Optimization Algorithms (e.g., TSP) - Efficient AI Models (e.g., Heuristics)
2	Python Programming	- GUI Programming (Tkinter) - Chat Application with Sockets - Data validation & input handling - Debugging & error handling	- Exception Handling & Testing - Encryption & Decryption - Use of global variables and system modules	- Natural Language Inputs - GUI input forms with personalization - Group project work	- Data processing efficiency - Visualization using PyLab - AI/ML applications for predictive analytics
3	IOT and Applications	- Domain-specific IoT applications (Unit 5) - Smart home & healthcare systems - IoT for automation in real-life context	- Security Challenges in IoT (Unit 4) - API Communication Models (Unit 1) - Gateways and Data Management (Unit 6)	- IoT application domains: surveillance, smart cities - IoT UI design via APIs	- Smart energy and industrial IoT applications (Unit 5) - Efficient sensor deployment and data aggregation (Unit 3)
4	Start-Up Project Part-1	-	-	-	-
SEMESTER-VIII					
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	PROGRAMMING WITH XML AND JSON	- Client-Server Models - Practical 7: String Reversal Server - Practical 8: Case Server - Team-based Socket Programming Projects	- Remote Command Execution (Practical 11) - File Access using Sockets (Practical 10) - DNS Implementation (Practical 12) - Use of Tools: who is, telnet, ftp, netstat, etc.	- Group-based lab assignments - Encouraging diverse examples in case-based programming - Open project ideas with social applications	- Efficient use of Routing Protocols (e.g., RIP, OSPF, BGP) - Use of Virtual Servers in Practical 13: Web Server via Sockets - Resource Optimization via Multicast Routing Protocols
2	START-UP PROJECT PART-1	-	-	-	-