Open Electives I , II and III

❖ **Computer Science and Engineering**
❖ **Computer Engineering**
❖ **Computer Science and Engineering (Data Science)**
❖ **Artificial Intelligence and Data Science**

Open Elective I: 3CS206OE1/2 | 3KE206OE1/2 | 3DS206OE1/2 | 3AD206OE1/2
   i.   Basics of Computing for Engineers   ii.   E-Commerce

Open Elective II: 4CS216OE1/2 | 4KE216OE1/2 | 4DS216OE1/2 | 4AD216OE1/2
   i.   Intellectual Property Rights   ii. Information Systems for Engineers

Open Elective III: 5CS230OE1/2 | 5KE230OE1/2 | 5DS230OE1/2 | 5AD230OE1/2
   i.   Cyber Laws and Ethics   ii.   Introduction to Data Analytics

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Subject Title: Basics of Computing for Engineers
Subject Code: 3CS206OE1 / 3KS206OE1 / 3DS206OE1   / 3AD206OE1
Semester: III | **Type:** Theory | **Credits**: 3
Total Contact Hours: 45 Hours

Pre-requisites:
- Basic understanding of mathematical logic and problem-solving.
- Familiarity with basic operations on a computer (keyboard, file handling, browsing).
- General curiosity towards technology and engineering applications.

Course Objectives:
- To introduce the fundamentals of computing and its applications across engineering domains.
- To familiarize students with core computing concepts such as data, logic, programming, and storage.
- To provide hands-on understanding of basic programming logic and computational thinking.
- To help students develop problem-solving skills using algorithms and flowcharts.
- To relate computing applications with real-life engineering challenges and tools.

Course Outcomes (COs):
After completing this course, students will be able to:
1. Understand the role of computing in modern engineering practices.
2. Apply basic logical reasoning and computational thinking to solve simple engineering problems.
3. Interpret data and operations using flowcharts, pseudo-code, and basic algorithms.
4. Recognize various computing tools used in engineering industries.
5. Appreciate ethical and societal implications of computing.

Syllabus:

Unit 1: Introduction to Computers & Computing (8 Hours)
Evolution and Applications of Computers in Engineering, Components of a Computer System: Hardware & Software, Operating Systems Basics (Windows/Linux), Introduction to Data, Binary Systems, and Memory Hierarchy, Role of Computers in Engineering Domains (CAD, CAM, Simulation, etc.).

Unit 2: Fundamentals of Programming & Logic Building (8 Hours)
Understanding Algorithms and Flowcharts, Variables, Constants, Data Types, Input/Output, Arithmetic and Logical Operators, Control Structures: if-else, loops (for, while), Problem Solving with Simple Pseudocode Examples.

Unit 3: Introduction to Computational Thinking (8 Hours)
What is Computational Thinking?, Abstraction, Decomposition, Pattern Recognition, Algorithm Design, Case Studies of Computational Thinking in Civil, Mechanical, and Electrical Engineering Real-World Examples using Block-Based Programming (e.g., Scratch or Blockly),

Unit 4: Data & File Management in Engineering (7 Hours)
Understanding Structured vs Unstructured Data, File Handling Basics (Creating, Reading, Writing Files), Data Representation (Tables, Graphs, Charts), Applications: Excel, Google Sheets, Data Logging in Labs.

Unit 5: Overview of Programming Tools & Environments (7 Hours)
Common Engineering Programming Tools (Python, MATLAB, Excel Macros), Introduction to Online IDEs, Simulators, and AutoCAD Programming, Cloud-Based Tools for Engineers (e.g., Google Colab, Replit), Software Tools in Design and Simulation.

Unit 6: Ethical and Professional Aspects of Computing (7 Hours)
Digital Citizenship and Responsible Use of Technology, Data Privacy, Cyber Ethics and Safety Open Source Software and Licensing, Introduction to Engineering Software Lifecycle & Automation, Relevance of Computing in Sustainable Engineering Practices.

CO-PO Mapping Table:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO10	PO12
CO1	3					2		2
CO2	2	3		2	3			2
CO3	2	3		3	3		2	
CO4		2			3		2	2
CO5						3	2	2

Textbook(s):
1. **"Computing Fundamentals and Programming in C"** – E. Balagurusamy, McGraw Hill Education, 2018
2. **"Let Us Compute"** – P. K. Sinha, BPB Publications, 2020

Reference Books:
1. **"Computational Thinking for the Modern Problem Solver"**, David D. Riley and Kenny A. Hunt, CRC Press, 2014
2. **"Python Programming for the Absolute Beginner"**, Michael Dawson, Cengage Learning, 2010
3. **"Introduction to Computation and Programming Using Python"**, John Guttag, MIT Press, 2016
4. **"Digital Fundamentals"**, Thomas L. Floyd, Pearson Education, 11th Edition
5. **"Introduction to Computers"**, Peter Norton, McGraw Hill Education, 7th Edition
6. **"Computational Thinking: A Beginner's Guide to Problem Solving and Programming"**, Karl Beecher, BCS Learning, 2017

==xx==

Semester: III | **Type**: Theory | **Credits**: 3
Total Contact Hours: 45 Hours
Pre-requisites:
- Basic knowledge of the Internet and Computers.
- General awareness of business and commerce.

Course Objectives:
- To introduce students to E-Commerce and its applications in modern business.
- To help students understand different types of online businesses and digital transactions.
- To familiarize students with online payment systems and digital security.
- To explore how technology supports E-Commerce, including mobile commerce and digital marketing.
- To discuss ethical, legal, and security aspects of E-Commerce.
- To provide an overview of future trends and career opportunities in the E-Commerce industry.

Course Outcomes (COs):
After completing this course, students will be able to:
1. Explain the basic concepts of E-Commerce and its significance.
2. Identify different types of online business models and their applications.
3. Understand digital payment methods and their security aspects.
4. Analyze the impact of digital marketing and online customer engagement.
5. Recognize legal, ethical, and cybersecurity challenges in E-Commerce.
6. Explore career opportunities and emerging trends in E-Commerce.

Syllabus:

UNIT 1: Introduction to E-Commerce (7 Hours)
Definition and Scope of E-Commerce, Advantages and Challenges of E-Commerce, Traditional vs. Digital Business, Popular E-Commerce Platforms (Amazon, Flipkart, Alibaba, etc.), Impact of E-Commerce on Society and Business

UNIT 2: E-Commerce Business Models & Online Marketplaces (8 Hours)
Types of E-Commerce Businesses (B2B, B2C, C2C, D2C, etc.), How Online Marketplaces Work (Amazon, eBay, Meesho, etc.), Selling Products and Services Online, Role of Small Businesses & Startups in E-Commerce, E-Commerce in Different Sectors (Retail, Education, Healthcare, etc.)

UNIT 3: Digital Payments and Security (7 Hours)
Overview of Online Payment Methods (UPI, Debit/Credit Cards, Digital Wallets), How Payment Gateways Work (Google Pay, PayPal, Razorpay, etc.), Security Concerns in Online Transactions, Best Practices for Safe Online Shopping, Case Study: Digital Payment Success in India (UPI, RuPay, etc.)

UNIT 4: Digital Marketing & Customer Engagement (7 Hours)
What is Digital Marketing?, Role of Social Media in E-Commerce (Facebook, Instagram, LinkedIn, etc.), Basics of Search Engine Optimization (SEO) & Online Advertising, How Businesses Use Email & Influencer Marketing, Customer Feedback & Personalization in E-Commerce

UNIT 5: Legal, Ethical & Cybersecurity Issues in E-Commerce (8 Hours)
Consumer Rights in Online Shopping, E-Commerce Laws & Regulations (IT Act, Consumer Protection Laws, etc.), Cybersecurity Threats (Hacking, Phishing, Data Privacy Issues), Ethical

Concerns in Online Business (Fake Reviews, Data Privacy), How to Protect Yourself While Shopping Online

UNIT 6: Emerging Trends & Career Opportunities in E-Commerce (8 Hours)
Growth of Mobile Commerce (M-Commerce), The Future of E-Commerce (AI, Augmented Reality, Metaverse), E-Commerce and Logistics (Online Delivery & Warehousing), Starting Your Own Online Business (Basic Steps & Challenges), Career Paths in E-Commerce (Marketing, Business, Technology Roles)

Textbooks:

"E-Commerce: Fundamentals and Applications", *Henry Chan and Raymond Lee*, **John Wiley & Sons**, 2001

Reference Books:

1. **"E-Commerce and Digital Business"** , *D. G. Harkut, K. N. Kasat,* **Notion Press, 2025.**
2. **"E-Commerce Essentials"**, *Kenneth C. Laudon, Carol Guercio Traver*, **Pearson Education**, 2014
3. **"Electronic Commerce 2018: A Managerial and Social Networks Perspective"**, *Efraim Turban, Jon Outland, David King, Jae Lee, Ting-Peng Liang*, **Springer**, 2018
4. **"Digital Marketing for Dummies"**, *Ryan Deiss, Russ Henneberry*, **John Wiley & Sons**, 2020
5. **"Click Millionaires: Work Less, Live More with an Internet Business You Love"**, *Scott Fox*, **AMACOM**, 2012
6. **"Cybersecurity and Cyberlaw"**, *Pavan Duggal*, **Universal Law Publishing**, 2019
7. **"The E-Commerce Book: About a Channel that Became an Industry"**, *Alexander Graf, Holger Schneider*, **Independently published**, 2021

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Subject Title: Intellectual Property Rights
Subject Code: 4CS216OE1 / 4KE216OE1 / 4DS216OE1 / 4AD216OE1
Semester IV | Type: Theory | **Credits**: 2
Total Contact Hours: 22–25 Hours

Course Prerequisite:
Basic understanding of communication skills, general ethics, and awareness of creative work (projects, research, design, coding, etc.)

Course Objectives:
- To provide students with foundational knowledge of Intellectual Property Rights (IPR) and their significance in innovation and research.
- To introduce different forms of intellectual properties such as patents, copyrights, trademarks, and designs.
- To create awareness about the legal and ethical aspects of protecting intellectual creations and innovations in engineering and beyond.

Course Outcomes:
On successful completion of the course, students will be able to:
1. Explain the significance of intellectual property in research, development, and innovation.
2. Identify various types of intellectual property and understand their application in different domains.

3. Demonstrate basic knowledge of procedures involved in protecting intellectual property and the roles of regulatory bodies.
4. Relate IPR knowledge to their project work, industrial applications, and entrepreneurship.

Syllabus:

Unit I: Introduction to Intellectual Property Rights (8 Hours)
Creativity, Innovation, and their Role in Development, What is Intellectual Property?, Types of Intellectual Property: Patents, Copyrights, Trademarks, Trade Secrets, Industrial Designs, and Geographical Indications, Importance of IPR in Engineering, Research, Startups, and Academia, Examples and Case Studies from various engineering disciplines.

Unit II: Patent, Copyright, and Design Protection (7 Hours)
Patent: What can be patented? Basic criteria (novelty, utility, non-obviousness), Simple steps of Patent Filing in India, Use of patents in project work or research, **Copyright**: For literature, music, software codes, and digital content, **Industrial Design**: Protection of new designs and their aesthetic value, Ownership, Licensing, and Rights of Creators.

Unit III: Trademarks, Geographical Indications & IPR in the Digital Era (7 Hours)
Trademarks: Brand names, logos, slogans – importance in business and marketing, **Geographical Indications**: Indian examples (e.g., Darjeeling Tea, Nagpur Orange), Role of IPR in Startups and Product Commercialization, Government Initiatives: National IPR Policy 2016, Startup India, Atmanirbhar Bharat, Career Opportunities in IPR, Case Studies and Recent Trends.

Text Books:
1. K. V. Nithyananda (2019), "Intellectual Property Rights: Protection and Management", Cengage Learning India.
2. P. Neeraj and D. Khusdeep (2014), "Intellectual Property Rights", PHI Learning.

Reference Books:
1. Deborah E. Bouchoux, "Intellectual Property for Paralegals", 4th Edition, Cengage Learning, 2012.
2. M. M. S. Karki, "Intellectual Property Rights: Basic Concepts", Atlantic Publishers, 2009.
3. V. K. Ahuja, "Law relating to Intellectual Property Rights", Lexis Nexis, 2017.
4. Prabuddha Ganguli, "Intellectual Property Rights – Unleashing the Knowledge Economy", Tata McGraw Hill, 2001.

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Subject Title: Information Systems for Engineers
Subject Code: 4CS216OE2   /   4KE216OE2   /   4DS216OE2   /   4AD216OE2
Semester IV | Type: Theory | **Credits**: 2
Total Contact Hours: 22–25 Hours

Prerequisites:
- Basic understanding of engineering processes and workplace practices.
- Familiarity with computer usage and basic productivity tools (Word, Excel, etc.).

Course Objectives:
1. To introduce the fundamental concepts of Information Systems (IS) and their relevance in engineering and business domains.
2. To explore how engineers can use IS for decision-making, automation, and efficiency.

3. To familiarize students with various types of information systems including MIS, ERP, and industrial systems.
4. To understand the challenges, risks, and future trends associated with the implementation of MIS.

Course Outcomes (COs):
After successful completion of the course, students will be able to:
1. Understand the basic structure and components of Information Systems used in engineering.
2. Identify and evaluate applications of Information Systems across different engineering disciplines.
3. Demonstrate understanding of ERP, MIS, and database systems and their integration with engineering workflows.

Unit-wise Syllabus:

Unit 1: Basics of Information Systems in Engineering (7–8 Hours)
Introduction to Information Systems: Definition, Need, and Importance, Components of IS: Hardware, Software, Data, People, Processes, Types of IS: Transaction Processing Systems (TPS), Management Information Systems (MIS), Decision Support Systems (DSS), Role of IS in different Engineering Domains (Manufacturing, Civil, Electrical, etc.).

Unit 2: Enterprise Systems and Engineering Applications (7–8 Hours)
Overview of Enterprise Resource Planning (ERP) Systems, Functional Modules in ERP: Finance, Production, Inventory, HR, Industrial Automation Systems & SCADA, Role of IS in Supply Chain, Maintenance, Quality, and Smart Manufacturing (Industry 4.0).

Unit 3: Emerging Trends and Case Studies in IS (7–8 Hours)
Cloud-Based Information Systems, Role of IoT and Data Analytics in Engineering IS, Engineering Workflow Automation with IS Tools (Examples: AutoCAD Vault, PLM, BIM), Case Studies: Use of IS in Smart Cities, Energy Management, Water Resource Planning, Challenges in IS Implementation: Data Security, Change Management, Cost.

CO–PO Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO12
CO1	3	2			2			2
CO2	2	3	2		2		2	2
CO3		2	3	2	3	2		3

Textbooks:
1. Laudon & Laudon, *Management Information Systems: Managing the Digital Firm*, Pearson Education, 2021
2. James A. O'Brien, *Introduction to Information Systems*, McGraw-Hill, 2020

Reference Books:
1. Rainer & Prince, *Introduction to Information Systems*, Wiley India, 2019
2. Turban et al., *Information Technology for Management*, Wiley, 2021
3. Monk & Wagner, *Concepts in Enterprise Resource Planning*, Cengage Learning, 2016
4. Mahadeo Jaiswal & M. Mital, *Management Information Systems*, Oxford University Press, 2015
5. Rajesh Ray, *Enterprise Resource Planning*, Tata McGraw Hill, 2011
6. Ghosh, *Management Information Systems*, PHI Learning, 2014

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Pre-requisites:
- Basic understanding of internet and computing
- Familiarity with digital communication and information sharing

Course Objectives:
By the end of the course, students will:
- To introduce the foundations of cyberspace and the nature of cybercrimes.
- To understand the national and international legal frameworks related to cyber laws.
- To develop ethical awareness and responsible behaviour in the digital environment.

Course Outcomes:
At the end of the course, students will be able to:
1. Understand the nature, types, and evolution of cybercrimes and ethical issues.
2. Describe legal provisions under Indian cyber laws and global cyber regulations.
3. Apply ethical principles and legal knowledge to real-world digital issues.

Syllabus:

Unit I: Introduction to Cyber Space and Cyber Crimes (8 Hours)
Evolution of the digital world and rise of cybercrimes, Types and categories: hacking, phishing, identity theft, cyberbullying, Impact on individuals and organizations, Case Study: The 202X Data Breach in India

Unit II: Legal Framework Governing Cyber Space (7 Hours)
Regulation of cyberspace and need for cyber laws , Overview of Indian IT Act 2000 and key amendments, Global treaties and conventions (e.g., Budapest Convention), Case Study: Indian Cyber Law implementation under IT Act.

Unit III: Cyber Ethics and Responsible Digital Citizenship (7 Hours)
Understanding cyber ethics, digital behavior, and online responsibilities, Concepts of privacy, consent, intellectual property, and digital rights, Ethical hacking, AI ethics, and future challenges in digital society, Case Study: Ethics and Cyberbullying / Ethical Hacking in Corporates

Textbook:
"Ethical Bytes: Navigating the Digital World with Integrity" *D. G.Harkut & K.N. Kasat*, Notion Press, 2023

Reference Books:
1. Nina Godbole & Sunit Belapure, *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Wiley India.
2. Vakul Sharma, *Information Technology Law and Practice*, Universal Law Publishing.
3. Pavan Duggal, *Cyber Law: The Indian Perspective*, Saakshar Law Publications.
4. Rodney Ryder, *Guide to Cyber Laws*, Wadhwa Publications.

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Subject Title: Introduction to Data Analytics
Subject Code: 5CS230OE2   /   5KE230OE2   /   5DS230OE2   /   5AD230OE2
Semster: V | Type: Theory | **Credits**: 2
Total Contact Hours: 22–25 Hours

Prerequisites:
- Basic understanding of mathematics and statistics at high school level.
- Familiarity with spreadsheets or tools like Excel.

Course Objectives:
1. To introduce the fundamental concepts and applications of data analytics in engineering and business.
2. To enable students to understand different types of data, data processing, and analysis techniques.
3. To equip students with practical knowledge of tools used in data visualization and basic modeling.
4. To develop the ability to interpret data and make informed decisions based on analytical findings.

Course Outcomes (COs):
After successful completion of the course, students will be able to:
Understand the basics of data types, sources, and the analytical process.
1. Apply basic data analysis techniques for real-world datasets.
2. Visualize data using appropriate tools and interpret results for decision-making.

Syllabus:

Unit 1: Fundamentals of Data Analytics (7–8 Hours)
Introduction to Data Analytics: Importance, Scope, and Applications, Types of Data: Structured, Semi-structured, and Unstructured, Data Lifecycle: Collection, Cleaning, Processing, Analysis, and Reporting, Introduction to Tools: Excel, Python, R (only basic overview), Role of Data Analytics in Engineering, Manufacturing, Business, and Public Policy.

Unit 2: Data Processing and Exploratory Analysis (7–8 Hours)
Data Preprocessing: Cleaning, Handling Missing Values, Filtering, Descriptive Statistics: Mean, Median, Mode, Standard Deviation, Introduction to Correlation and Covariance, Basics of Sampling, Data Grouping, Sorting, Hands-on Demonstration using Excel or Google Sheets.

Unit 3: Data Visualization and Decision Making (7–8 Hours)
Principles of Data Visualization: Importance and Types, Tools for Visualization: Excel Charts, Google Sheets, Tableau Public (overview), Creating Bar Charts, Line Charts, Histograms, Pie Charts, Dashboards and Storytelling with Data, Use Cases: Analytics in Retail, Healthcare, Engineering Systems, Ethical Considerations in Data Use: Bias, Privacy, and Transparency.

CO–PO Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO10	PO12
CO1	3	2			2			2
CO2	2	3	2		3		2	2
CO3		2	2	2	3	2	3	3

Textbooks:
1. **"Data Analytics Made Accessible"** by Anil Maheshwari, Amazon Publishing, 2017
2. **"Data Science for Business"** by Foster Provost and Tom Fawcett, O'Reilly Media, 2013

Reference Books:
1. **"Fundamentals of Data Analytics"** by Bharti Motwani, Wiley India, 2019
2. **"Data Analytics Using Excel"** by Seema Acharya, McGraw Hill Education, 2021
3. **"Naked Statistics"** by Charles Wheelan, W. W. Norton & Company, 2014
4. **"Storytelling with Data"** by Cole Nussbaumer Knaflic, Wiley, 2015
5. **"Python for Data Analysis"** by Wes McKinney, O'Reilly Media, 2018
6. **"Business Analytics – Data Analysis & Decision Making"** by S. Christian Albright and Wayne Winston, Cengage Learning, 2016

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