# COURSE STRUCTURE

## *for*

## B.TECH. DEGREE

## *in*

## COMPUTER SCIENCE & DESIGN

### *(Applicable from the academic session 2024-2025)*
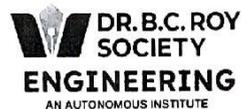
The first year course structure (Page 3 and Page 4) is unanimously accepted and approved in the first BoS meeting held in the Department of a) Physics, b) Chemistry, c) Mathematics, d) English, e) Electrical Engineering, f) Electronics and Communication Engineering, g) Computer Science and Engineering, h) Mechanical Engineering.

The BoS of CSD (Computer Science & Design) in its first meeting (held in the Department of CSD (Computer Science & Design) on 6th November 2024 has unanimously accepted and approved the four year course structure of CSD (Computer Science & Design).

HOD
Computer Sc. & Design
Dr. B. C. Roy Engineering College

# Dr. B. C. Roy Engineering College, Durgapur
## (An Autonomous Institution)
### Syllabus for B. Tech in Computer Science & Design

| Semester: VIII | | | | | |
|---|---|---|---|---|---|
| Sl. No. | Course Type | Course Code | Course Title | Engagement Type | Credit |
| 1 | PE | CSD-811 | Inclusive Design, Universal Design & Accessibility | T | 3 |
| | | CSD-812 | Visual Design & Communication | | |
| | | CSD-813 | Cyber Security, Law and Ethics | | |
| | | CSD-814 | Ethics in AI | | |
| 2 | PJ | CSD-881 | Project-II (Major) | S | 6 |
| TOTAL CREDIT | | | | | 9 |

# Dr. B. C. Roy Engineering College, Durgapur
## (An Autonomous Institution)
### Syllabus for B. Tech in Computer Science & Design

| Semester-VIII | | | |
|---|---|---|---|
| **Subject/Course Name** | Inclusive Design, Universal Design & Accessibility | **Subject/Course Code** | CSD-811 |
| **Contact Lecture/Week** | 3 | **Tutorial** | 1 |
| **Credit** | 3 | **Maximum Marks** | 100 |
| **Examination Scheme** | | | |
| Mid Semester exam: 15 | Assignment and Quiz: 10 marks | Attendance: 5 marks | End Semester Exam :70 Marks |

| Objective | |
|---|---|
| 1 | This course provides a broad overview of the generic concepts of design |
| 2 | Design thinking and design research |
| 3 | Processes and techniques |

| Prerequisite | |
|---|---|
| 1 | |

| Unit | Content | Hours/Unit |
|---|---|---|
| 1 | Introduction: Examples of different kinds of designs and designers, Good and bad designs, Design problems, Definition of Design, engineering design and design research Their Importance. | 8 |
| 2 | Product life cycle, Morphology of design, Introduction to system design process, Stage models. Introduction to Task Clarification: overall process and steps, Methods for Data collection and collation including patent analysis, Methods for identification of requirements: Role Playing, Checklists, Solution neutral problem statements, etc. | 7 |
| 3 | Quantifying requirements and Assigning importance to requirements, Linking Customer requirements to engineering requirements: Quality Function Deployment techniques. | 5 |
| 4 | Introduction to conceptual design: Identification of functions, Ideation, Simulation and Consolidation into solution proposals, Methods for Identification of functions such as functional decomposition techniques, Methods for Ideation, such as Brainstorming, Synectics, etc., Methods for consolidation into solution proposals, such as Morphological charts, Morphological matrix, etc., | 10 |
| 5 | Methods for simulation: analytical, virtual and physical simulations, Methods for improvement of solution proposals, such as contradiction analysis, various other TRIZ techniques, etc, Systematic evaluation of concepts: ordinal methods and cardinal methods | 8 |

| | Textbook and Reference Books |
|---|---|
| 1 | Christine Charyton, *Creative Engineering Design Assessment*, Springer |
| 2 | Warren K Wake Wake, *Design Paradigms: A Sourcebook for Creative Visualization*, John Wiley & Sons |

**Course Outcome:** On completion of the course students will be able to

| | |
|---|---|
| CSD-811.1 | Define / Explain the fundamental concepts / terms of Inclusive Design, Universal Design & Accessibility and its necessity / importance. |
| CSD-811.2 | Apply the basic principles to solve simple model problems related to Inclusive Design, Universal Design & Accessibility in the real world. |
| CSD-811.3 | Analyze a given Inclusive Design, Universal Design & Accessibility problem, design and implement a solution, and compute the output. |
| CSD-811.4 | Identify sub-tasks / sub-systems , Perform Diagnostic assessment of an Inclusive Design, Universal Design & Accessibility problem, integrate / interconnect these sub-tasks to design an integrated working solution and Evaluate the solution. |
| CSD-811.5 | Identify unsolved real world Inclusive Design, Universal Design & Accessibility problems, Synthesize pragmatic ideas and Create innovative solutions to such problems |

**Course Articulation Matrix:**

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

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| CO1 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 |

| Semester-VIII | | | |
|---|---|---|---|
| **Subject/Course Name** | Visual Design & Communication | **Subject/Course Code** | CSD-812 |
| **Contact Lecture/Week** | 3 | **Tutorial** | 1 |
| **Credit** | 3 | **Maximum Marks** | 100 |
| **Examination Scheme** | | | |
| Mid Semester exam: 15 | Assignment and Quiz: 10 marks | Attendance: 5 marks | End Semester Exam :70 Marks |

**Objective**

| 1 | **VISUAL DESIGN**<br>Based on the premise that Visual Design is a discipline of design that applies the principles of visual language for better analysis and understanding of design problem and solution, this course focuses on the elements and principles of the visual language and their semantic use. A multi-disciplinary domain, design consists of aesthetics, architecture, products, communication, processes, systems, technology, business/commerce, ramification on environment and society and demands clear understanding of design fundamentals. Apart from the thorough knowledge of core concepts, design also requires the representation of concepts visually to make effective or functional communication and iteration of ideas. For creative skills and aesthetic sense, one must clearly understand the use of basic design elements and their applications for a particular design solution. For a designer to communicate more concisely and in a visually appropriate manner, it is necessary to use commonly understood principles, perspective and design layout standards. Together, these conventions constitute a visual language, and help to ensure that the drawing is clear and relatively easy to understand. |
|---|---|
| 2 | **VISUAL COMMUNICATION**<br>The concept and science of Visual Communication is introduced as the relationship between human information processing, with emphasis on processing of visual information and design of messages. It includes visual perception, organization, semantics, working memory (STM & LTM) and their implications.<br>The course also introduces students to the fundamentals of Typography and Photography. The Typography course introduces students to the fundamentals of Typography and its application in effective product interface/communication. And the Photography course introduces the students to photography as a medium of visual language and applies it to visual design. In today's world that is crowded with visual stimulus it is important to cut through the noise and be able to decipher, captureand create visual images that communicate. |

**Prerequisite**

| 1 | Concept on Graphics, DESIGN DRAWING, VISUALISATION, Working Knowledge of Software like Adobe Photoshop, Illustrator and In design (Alternate Open Source.) |
|---|---|

| Unit | Content | Hours/Unit |
|---|---|---|

| 1 | **INTRODUCTION TO VISUAL DESIGN:** The importance of understanding visual language and its relation in context to nature and environment. **ELEMENTS OF VISUAL LANGUAGE** Exploring and understanding Dots, Lines, Forms, Space, Pattern, Texture and Colour as elements of visual language. **INTRODUCTION TO THE PRINCIPLES OF VISUAL LANGUAGE** Visual explorations and experiments with Form, Colour, and Space, Texture, in relation to the context and environments – Concepts of harmony, balance, contrast, proportion, order, symmetry, asymmetry, rhythm, tension, juxtaposition, proximity, size, scale, proportion, orientation, alignment, variety, gradation, dominance, subordination, transition etc. | 10 |
|---|---|---|
| 2 | **INTRODUCTION TO FUNDAMENTALS OF TYPOGRAPHY** Introduces Typography as a means of Communication and engages in typographical explorations to understand the technicalities, nuances and aesthetics of types, Study of visual principles of text and image composition: Layouts, Grids, Content Development and Information Hierarchy. Application of Typography, Image and layouts in the design of signage systems, identity systems, social communications | 10 |
| 3 | **INTRODUCTION TO PHOTOGRAPHY** Study of photography as a medium to document, communicate and create photographic imagery. Exploring photo story as a narrative medium. **INTRODUCTION TO VIDEOGRAPHY** Study of videography as a medium to document, communicate and create a short video. | 8 |
| 4 | **COMMUNICATION THEORIES, SEMIOTICS AND VISUAL PERCEPTION** Understand the process of communication and the theories that make a difference to the development of a visual language. **STORY TELLING, NARRATIVES AND ITS ROLE IN DESIGN** Understand storytelling and narratives as effective methods to scope problems and problem solving processes. | 8 |

**Textbook and Reference Books**

| 1 | |
|---|---|

**Course Outcome:** On completion of the course students will be able to

| CSD-812.1 | Define / Explain the fundamental concepts / terms of Visual Design & Communication and its necessity / importance. |
|---|---|
| CSD-812.2 | Apply the basic principles to solve simple model problems related to Visual Design & Communication in the real world. |
| CSD-812.3 | Analyze a given Visual Design & Communication problem, design and implement a solution, and compute the output. |
| CSD-812.4 | Identify sub-tasks / sub-systems , Perform Diagnostic assessment of a Visual Design & Communication problem, integrate / interconnect these sub-tasks to design an integrated working solution and Evaluate the solution. |
| CSD-812.5 | Identify unsolved real world Visual Design & Communication problems, Synthesize pragmatic ideas and Create innovative solutions to such problems |

**Course Articulation Matrix:**

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

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| CO1 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 |

| Semester-VIII | | | |
|---|---|---|---|
| **Subject/Course Name** | Cyber Security Laws and Ethics | **Subject/Course Code** | CSD-813 |
| **Contact Lecture/Week** | 3 | **Tutorial** | 1 |
| **Credit** | 3 | **Maximum Marks** | 100 |
| **Examination Scheme** | | | |
| Mid Semester exam: 15 | Assignment and Quiz: 10 marks | Attendance: 5 marks | End Semester Exam :70 Marks |
| **Objective** | | | |
| 1 | To develop an understanding of modern network architectures from a design and performance perspective. | | |
| 2 | To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs). | | |
| 3 | To provide an opportunity to do network programming | | |
| 4 | To provide WLAN measurement ideas. | | |
| **Prerequisite** | | | |
| 1 | | | |
| 2 | | | |

| Unit | Content | Hours/Unit |
|---|---|---|
| 1 | Introduction: Introduction to Cyber Security, Importance and challenges in CyberSecurity, Cyberspace, Cyber threats, Cyberwarfare, CIA Triad, Cyber Terrorism,Cyber Security of Critical Infrastructure, Cybersecurity - Organizational Implications. | 6 |
| 2 | Hackers and Cyber Crimes: Types of Hackers, Hackers and Crackers, Cyber Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors. | 7 |
| 3 | Ethical Hacking and Social Engineering: Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modelling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing, Types of Social Engineering, Insider Attack, Preventing Insider Threats, Social Engineering Targets and Defence Strategies, Introduction to Cyber Forensics and Auditing. | 10 |

| 4 | Cyber Ethics and Laws: Introduction to Cyber Laws, E-Commerce and E Governance, Certifying Authority and Controller, Offences under IT Act, Computer Offences and its penalty under IT Act 2000, Intellectual Property Rights in Cyberspace at NetworkLayer-IPSec. Indian laws, IT act, Public key certificate. | 5 |
|---|---|---|
| 5 | Introduction of Cybercrime: Forgery, Software Piracy, Computer Network intrusion. Category of Cybercrime: how criminals plan attacks, passive attack, Active attacks, cyberstalking, Security challenges posted by mobile devices, cryptographic security for mobile devices, Tools and Methods used in Cyber crime, Phishing & Identity Theft. | 10 |

**Textbook and Reference Books**

| 1 | Cyber security, Nina Gobole & Sunit Belapune; Pub: Wiley India. |
|---|---|
| 2 | Information Security and Cyber Laws, Pankaj Agarwal |
| 3 | Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., Enterprise Cybersecurity -How to Build a Successful Cyber defense Program Against Advanced Threats, A-press |
| 4 | Nina Godbole, Sumit Belapure, Cyber Security, Willey |
| 5 | Hacking the Hacker, Roger Grimes, Wiley |
| 6 | Cyber Law By Bare Act, Govt Of india, It Act 2000. |
| 7 | Information Security & Cyber Laws, Gupta & Gupta, Khanna Publishing House, (AICTE RecommendedTextbook- 2018) |

**Course Outcome:** On completion of the course students will be able to

| CSD-813.1 | Define / Explain the fundamental concepts / terms of Cyber Security Laws and Ethics and its necessity / importance. |
|---|---|
| CSD-813.2 | Apply the basic principles to solve simple model problems related to Cyber Security Laws and Ethics in the real world. |
| CSD-813.3 | Analyze a given Cyber Security Laws and Ethics problem, design and implement a solution, and compute the output. |
| CSD-813.4 | Identify sub-tasks / sub-systems , Perform Diagnostic assessment of a Cyber Security Laws and Ethics problem, integrate / interconnect these sub-tasks to design an integrated working solution and Evaluate the solution. |
| CSD-813.5 | Identify unsolved real world Cyber Security Laws and Ethics problems, Synthesize pragmatic ideas and Create innovative solutions to such problems |

**Course Articulation Matrix:**

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

|       | PSO1 | PSO2 | PSO3 |
| :---: | :---: | :---: | :---: |
| **CO1** | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 |

| Semester-VIII | | | |
|---|---|---|---|
| **Subject/Course Name** | Ethics in AI | **Subject/Course Code** | CSD-814 |
| **Contact Lecture/Week** | 3 | **Tutorial** | 1 |
| **Credit** | 3 | **Maximum Marks** | 100 |
| **Examination Scheme** | | | |
| **Internal Exam (CIA)** | 40 | **Final Exam (ESE)** | 60 |
| **Objective** | | | |
| 1 | Study the morality and ethics in AI | | |
| 2 | Learn about the Ethical initiatives in the field of artificial intelligence | | |
| 3 | Study about AI standards and Regulations | | |
| 4 | Study about social and ethical issues of Robot Ethics | | |
| 5 | Study about AI and Ethics- challenges and opportunities | | |

| Prerequisite | |
|---|---|
| 1 | |

| Unit | Content | Hours/Unit |
|---|---|---|
| 1 | Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet-Impact on trust | 6 |
| 2 | International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles , Warfare and weaponization | 6 |
| 3 | 6Model Process for Addressing Ethical Concerns During System Design – Transparency of Autonomous Systems-Data Privacy Process- Algorithmic  Bias Considerations- Ontological Standard for Ethically Driven Robotics and Automation Systems | 9 |
| 4 | Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science  and Technology - Ethical Issues in an ICT Society- Harmonization of Principles Ethics and Professional Responsibility- Roboethics Taxonomy | 8 |
| 5 | Challenges - Opportunities- ethical issues in artificial intelligence Societal Issues Concerning the Application of Artificial Intelligence in Medicine decision-making role in industries-National and International Strategies on AI | 6 |
| **Textbook and Reference Books** | | |

| 1 | Y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield ,"The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452– March 2020 |
|---|---|
| 2 | Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014. |
| 3 | Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence:Foundations, Theory, and Algorithms) by Paula Boddington, November 2017 |
| 4 | Mark Coeckelbergh," AI Ethics", The MIT Press Essential Knowledge series, April 2020 |
| 5 | |

**Course Outcome :** On completion of the course students will be able to

| CSD-814.1 | Define / Explain the fundamental concepts / terms of Ethics in AI and its necessity / importance. |
|---|---|
| CSD-814.2 | Apply the basic principles to solve simple model problems related to Ethics in AI in the real world. |
| CSD-814.3 | Analyze a given Ethics in AI problem, design and implement a solution, and compute the output. |
| CSD-814.4 | Identify sub-tasks / sub-systems , Perform Diagnostic assessment of an Ethics in AI problem, integrate / interconnect these sub-tasks to design an integrated working solution and Evaluate the solution. |
| CSD-814.5 | Identify unsolved real world Ethics in AI problems, Synthesize pragmatic ideas and Create innovative solutions to such problems |

**Course Articulation Matrix:**

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

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 |

# Dr. B. C. Roy Engineering College, Durgapur
## (An Autonomous Institution)
### Syllabus for B. Tech in Computer Science & Design

| Semester-VIII | | | |
|---|---|---|---|
| **Subject/Course Name** | Project II (Majo) | **Subject/Course Code** | CSD-881 |
| **Contact Lecture/Week** | | **Tutorial** | Nil |
| **Credit** | 6 | **Maximum Marks** | 100 |
| **Examination Scheme** | | | |
| **Internal Exam (CIA)** | Nil | **Final Exam (ESE)** | 100 |
| **Objective** | | | |
| 1 | | | |
| **Prerequisite** | | | |
| 1 | | | |

**Course Articulation Matrix:**

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

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 |