# CURRICULUM 2023 (Autonomous)

Draft
Version 1.0

## B.TECH
## Computer Science and Engineering (AI)


**MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY**
**Mar Ivanios Vidyanagar, Nalanchira, Thiruvananthapuram – 695 015**
**August 2023**

# CURRICULUM

FOR

## B. TECH DEGREE PROGRAMME

IN

## COMPUTER SCIENCE AND ENGINEERING
## (Artificial Intelligence)

**2023 SCHEME**

**(AUTONOMOUS)**

**MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY**
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# MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**B.TECH DEGREE PROGRAMME**

**IN**

**COMPUTER SCIENCE AND ENGINEERING (Artificial Intelligence)**

**CURRICULUM AND FIRST YEAR SYLLABI**

**2023 SCHEME**

| Items | Board of Studies (BOS) | Academic Council (AC) |
|---|---|---|
| Date of Approval | 10/7/2023 | 09/08/2023 |

**Head of the Department**
**Chairman, Board of Studies**

**Principal**
**Chairman, Academic Council**

## MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

### Vision and Mission of the Institution

**Vision:**
To be an Institution moulding globally competent professionals as epitomes of Noble Values.

**Mission:**
To transform the Youth as technically competent, ethically sound and socially committed professionals, by providing a vibrant learning ambience for the welfare of humanity.

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

### Vision and Mission of the Department

**Vision:**
To be a Centre of Excellence in Computer Science and Engineering providing quality education and researchfor the betterment of the society.

**Mission:**
To impart sound knowledge in theoretical and applied foundations of Computer Science and Engineering, andto train the students to solve real life issues to effectively define and shape life.

# PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

**PEO1:** Graduates will be successful professionals in Industries of core or interdisciplinary nature or entrepreneurs, demonstrating effective leadership and excellent team work.

**PEO2:** Graduates will expand the horizon of knowledge through higher education or research,leading to self-directed professional development

**PEO3:** Graduates will demonstrate competency in AI & ML, professional attitude and ethics whileproviding solutions in societal and environmental contexts

# PROGRAMME OUTCOMES (POs)

Engineering graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public healthand safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive

clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independentand life-long learning in the broadest context of technological change.

## PROGRAMME SPECIFIC OUTCOMES (PSOs)

**PSO1:** To apply Algorithmic Principles, Programming Skills and Software Engineering Principles to design, develop and evaluate Software Systems of varying complexities.

**PSO2:** To apply knowledge of System Integration to design and implement computer-based systems

**PSO3:** To solve real world and socially relevant problems using AI

# DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

## B.TECH COMPUTER SCIENCE AND ENGINEERING (Artificial Intelligence)

*For the students admitted from 2023*

## Scheduling of Courses

### i) Knowledge Segments and Credits

Every course of B. Tech Programme is placed in one of the nine categories as listed in the following table.

No semester shall have more than six lecture-based courses and two laboratory courses,

and/or drawing/seminar/project courses in the curriculum.

| Sl. No. | Category | Category Code | 2023 |
|---|---|---|---|
| 1 | Humanities and Social Sciences including Management Courses | HSC | 6 |
| 2 | Basic Science Courses | BSC | 26 |
| 3 | Engineering Science Courses | ESC | 22 |
| 4 | Programme Core Courses, Comprehensive Course Work and Viva Voce | PCC | 69 |
| 5 | Programme Elective Courses | PEC | 18 |
| 6 | Institute Elective Courses | IEC | 6 |
| 7 | Project Work and Seminar | PWS | 13 |
| 8 | Mandatory Non-credit Courses (P/F) with Grade | MNC | -- |
| 9 | Mandatory Student Activities (P/F) | MSA | 3 |
| | **Total Mandatory Credits** | | **163** |
| | Value Added Courses (Optional) – Honours/Minor | | 15 |

### ii) Semester-wise Credit Distribution

| ***Semester*** | **I** | **II** | **III** | **IV** | **V** | **VI** | **VII** | **VIII** | ***Total Credits*** |
|---|---|---|---|---|---|---|---|---|---|
| *Credits for Courses* | 18 | 20 | 22 | 23 | 21 | 22 | 19 | 15 | **160** |
| | 38 | | 45 | | 43 | | 34 | | **160** |

| SEMESTER I | | | | | | |
|---|---|---|---|---|---|---|
| **Slot** | **Category Code** | **Course Number** | **Courses** | **L-T-P-J** | **Hours** | **Credit** |
| A | BSC | 23MAL10A | Linear Algebra and Calculus | 3-1-0-0 | 4 | 4 |
| B | BSC | 23PYL10A | Engineering Physics | 3-1-0-0 | 4 | 4 |
| D | ESC | 23ESB10E | Programming in C | 2-1-2-0 | 5 | 4 |
| E | ESC | 23ESL10J/<br>23ESL10L | Basics of Electrical Engineering-A<br>Basics of Electronics Engineering | 2-0-0-0<br>2-0-0-0 | 4 | 2<br>2 |
| G | MNC | 23NCL10A | Environmental Science | 2-0-0-0 | 2 | -- |
| S | BSC | 23PYP10A | Engineering Physics Lab | 0-0-2-0 | 2 | 1 |
| T | ESC | 23ESP10B | Electrical and Electronics Workshop | 0-0-2-0 | 2 | 1 |
| **TOTAL** | | | | | **23** | **18** |

| SEMESTER II | | | | | | |
|---|---|---|---|---|---|---|
| **Slot** | **Category Code** | **Course Number** | **Courses** | **L-T-P-J** | **Hours** | **Credit** |
| A | BSC | 23MAL10B | Vector Calculus, Differential Equations and Transforms | 3-1-0-0 | 4 | 4 |
| B | BSC | 23CYL10A | Engineering Chemistry | 3-1-0-0 | 4 | 4 |
| C | ESC | 23ESB10A | Engineering Graphics | 2-0-2-0 | 4 | 3 |
| D | ESC | 23ESB10H | Programming using Python | 2-0-2-0 | 4 | 3 |
| E | ESC | 23ESL10Q | Digital Electronics | 3-0-0-0 | 3 | 3 |
| G | MNC | 23NCJ10B | Professional Communication | 2-0-0-2 | 4 | - |
| S | BSC | 23CYP10A | Engineering Chemistry Lab | 0-0-2-0 | 2 | 1 |
| T | ESC | 23ESB10P | Manufacturing and Construction Practices-B | 1-0-2-0 | 3 | 2 |
| **TOTAL** | | | | | **28** | **20** |

| SEMESTER III | | | | | | |
|---|---|---|---|---|---|---|
| **Slot** | **Category Code** | **Course Number** | **Courses** | **L-T-P-J** | **Hours** | **Credit** |
| A | BSC | 23MAL20B | Discrete Mathematical Structures | 3-1-0-0 | 4 | 4 |
| B | PCC | 23CSL20A | Data Structures | 3-1-0-0 | 4 | 4 |
| C | PCC | 23CSL20B | Computer Organization and Architecture | 3-1-0-0 | 4 | 4 |
| D | PCC | 23CSB20C | Object Oriented Programming Concepts | 3-0-2-0 | 5 | 4 |
| E | ESC | 23ESL00A | Design Engineering | 2-0-0-0 | 2 | 2 |
| G | MNC | 23NCL20A | Professional Ethics | 2-0-0-0 | 2 | --- |
| S | PCC | 23CSP20A | Hardware Lab | 0-0-3-0 | 3 | 2 |
| T | PCC | 23CSP20B | Data Structures Lab | 0-0-3-0 | 3 | 2 |
| R/ M | VAC | | Remedial/Minor Course | 3-0-0-0 | 3 | 3 |
| TOTAL | | | | | **27/30** | **22/25** |

| SEMESTER IV | | | | | | |
|---|---|---|---|---|---|---|
| **Slot** | **Category Code** | **Course Number** | **Courses** | **L-T-P-J** | **Hours** | **Credit** |
| A | BSC | 23MAL20D | Probability, Statistics and Numerical Methods | 3-1-0-0 | 4 | 4 |
| B | PCC | 23CSL20D | Operating Systems | 3-1-0-0 | 4 | 4 |
| C | PCC | 23CSL20E | Database Management Systems | 3-1-0-0 | 4 | 4 |
| D | PCC | 23CSL20F | Formal Languages and Automata Theory | 3-1-0-0 | 4 | 4 |
| E | HSC | 23HSL20A | Universal Human Values- II | 3-0-0-0 | 3 | 3 |
| G | MNC | 23NCL20B | Industrial Safety Engineering | 2-1-0-0 | 3 | --- |
| S | PCC | 23CSP20C | Operating Systems Lab | 0-0-3-0 | 3 | 2 |
| T | PCC | 23CSP20D | Database Lab | 0-0-3-0 | 3 | 2 |
| R/M /H | VAC | | Remedial/Minor/Honours Course | 3-0-0-0 | 3 | 3 |
| **TOTAL** | | | | | **28/31** | **23/26** |

| SEMESTER V | | | | | | |
|---|---|---|---|---|---|---|
| **Slot** | **Category Code** | **Course Number** | **Courses** | **L-T-P-J** | **Hours** | **Credit** |
| A | PCC | 23CSL30A | Computer Networks | 3-1-0-0 | 4 | 4 |
| B | PCC | 23CTL30A | Introduction to Artificial Intelligence | 3-0-0-0 | 3 | 3 |
| C | PCC | 23CSJ30C | Web Technology | 2-0-2-1 | 5 | 4 |
| D | PEC | 23CTL31X | Programme Elective I | 2-1-0-0 | 3 | 3 |
| E | HSC | 23HSL30A | Business Economics and Accountancy | 3-0-0-0 | 3 | 3 |
| S | PCC | 23CTP30A | Artificial Intelligence Lab | 0-0-3-0 | 3 | 2 |
| T | PCC | 23CSP30B | Network Lab | 0-0-3-0 | 3 | 2 |
| R/M/H | VAC | | Remedial/Minor/Honours Course | 3-0-0-0 | 3 | 3 |
| **TOTAL** | | | | | **24/27** | **21/24** |

| SEMESTER VI | | | | | | |
|---|---|---|---|---|---|---|
| **Slot** | **Category Code** | **Course Number** | **Courses** | **L-T-P-J** | **Hours** | **Credit** |
| A | PCC | 23CSL30D | Algorithm Analysis and Design | 3-1-0-0 | 4 | 4 |
| B | PCC | 23CTJ30B | Machine Learning | 2-0-2-1 | 5 | 4 |
| C | PCC | 23CSB30F | Software Engineering Theory and Practices | 3-0-2-0 | 5 | 4 |
| E | IEC | 23IEL31X | Institute Elective 1 | 3-0-0-0 | 3 | 3 |
| F | PEC | 23CTL32X | Programme Elective II | 2-1-0-0 | 3 | 3 |
| T | PWS | 23CTS38A | Seminar | 0-0-4-0 | 4 | 2 |
| U | PWS | 23CTJ38B | Miniproject | 0-0-4-0 | 4 | 2 |
| R/M/H | VAC | | Remedial/Minor/Honours Course | 3-0-0-0 | 3 | 3 |
| **TOTAL** | | | | | **28/31** | **22/28** |

| SEMESTER VII | | | | | | |
|---|---|---|---|---|---|---|
| **Slot** | **Category Code** | **Course Number** | **Courses** | **L-T-P-J** | **Hours** | **Credit** |
| A | PCC | 23CTL40A | Robotics and Intelligent systems | 3-0-0-0 | 3 | 3 |
| B | PCC | 23CTL40B | Deep Learning | 3-0-0-0 | 3 | 3 |
| C | PCC | 23CTB40C | Big Data Analytics | 2-0-2-0 | 4 | 3 |
| D | PEC | 23CTL43X | Programme Elective III /Industry Elective1 | 2-1-0-0 | 3 | 3 |
| E | IEC | 23IEL42X | Institute Elective 2 | 2-1-0-0 | 3 | 3 |
| S | PCC | 23CTP40A | Robotics Lab | 0-0-2-0 | 2 | 1 |
| T | PWS | 23CTV48A | Comprehensive Course Viva | 0-0-2-0 | 2 | 1 |
| U | PWS | 23CTJ48B | Project Phase I | 0-0-4-0 | 4 | 2 |
| R/M /H | VAC | | Remedial/Minor/Honours Course | 0-0-6-0/ 3-0-0-0 | 6/3 | 3 |
| **TOTAL** | | | | | **24 30/27** | **19/21** |

| SEMESTER VIII | | | | | | |
|---|---|---|---|---|---|---|
| **Slot** | **Category Code** | **Course Number** | **Courses** | **L-T-P-J** | **Hours** | **Credit** |
| A | PEC | 23CTL44X | Programme Elective IV | 2-1-0-0 | 3 | 3 |
| B | PEC | 23CTL45X | Programme Elective V | 2-1-0-0 | 3 | 3 |
| C | PEC | 23CTL46X | Programme Elective VI | 2-1-0-0 | 3 | 3 |
| U | PWS | 23CTJ48C | Project Phase II | 0-0-12-0 | 12 | 6 |
| R/M/H | VAC | | Remedial/Minor/Honours Course | 0-0-6-0 | 6 | 3 |
| **TOTAL** | | | | | **21/27** | **15/18** |

## PROGRAMME ELECTIVE I

| Slot | Category Code | Course Number | Courses | L-T-P | Hours | Credit |
|---|---|---|---|---|---|---|
| E | PEC | 23CSL31D | Parallel Computer Architecture | 2-1-0 | 3 | 3 |
| | | 23CTL31B | Concepts in Computer graphics and image processing | 2-1-0 | 3 | 3 |
| | | 23CTL31C | Intelligent Model Design and Thinking | 2-1-0 | 3 | 3 |
| | | 23CTL31D | Social Network Analysis | 2-1-0 | 3 | 3 |
| | | 23CTL31E | Data Mining | 2-1-0 | 3 | 3 |
| | | 23CSL31F | Programming in R | 2-1-0 | 3 | 3 |
| | | 23CTL31F | Full stack Development | 2-1-0 | 3 | 3 |

## PROGRAMME ELECTIVE II

| Slot | Category Code | Course Number | Courses | L-T-P | Hours | Credit |
|---|---|---|---|---|---|---|
| D | PEC | 23CSL32F | Computational Linguistics | 2-1-0 | 3 | 3 |
| | | 23CTL32A | Image and Video Analytics | 2-1-0 | 3 | 3 |
| | | 23CTL32C | AI Ethics and Responsible AI | 2-1-0 | 3 | 3 |
| | | 23CSL32D | High Performance Computing | 2-1-0 | 3 | 3 |
| | | 23CTL32D | Web Intelligence and Big Data | 2-1-0 | 3 | 3 |
| | | 23CTL32E | Intrusion Detection and Prevention Systems | 2-1-0 | 3 | 3 |
| | | 23CSL32C | Foundations of Security in Computing | 2-1-0 | 3 | 3 |
| | | 23CSL32E | Cloud Computing | 2-1-0 | 3 | 3 |

## PROGRAMME ELECTIVE III

| Slot | Category Code | Course Number | Course | L-T-P-J | Hours | Credit |
|---|---|---|---|---|---|---|
| C | PEC | 23CSL43F | Natural Language Processing | 2-1-0-0 | 3 | 3 |
| | | 23CTL43B | Computer Vision | 2-1-0-0 | 3 | 3 |
| | | 23CTL43C | Artificial Neural Networks | 2-1-0-0 | 3 | 3 |
| | | 23CSL43D | Domain Specific Accelerators | 2-1-0-0 | 3 | 3 |
| | | 23CTL43D | IoT for AI | 2-1-0-0 | 3 | 3 |
| | | 23CTL43E | AI For Cyber Security | 2-1-0-0 | 3 | 3 |
| | | 23CTL43F | Human Computer Interaction | 2-1-0-0 | 3 | 3 |
| | | 23CTL43G | DataScience | 2-1-0-0 | 3 | 3 |

**PROGRAMME ELECTIVE IV**

| Slot | Category Code | Course Number | Courses | L-T-P-J | Hours | Credit |
|---|---|---|---|---|---|---|
| A | PEC | 23CTL44A | Deep Learning for Signal & Image Processing | 2-1-0-0 | 3 | 3 |
| | | 23CTL44B | Data and Visual analytics in AI | 2-1-0-0 | 3 | 3 |
| | | 23CTL44C | Knowledge Engineering and Expert Systems | 2-1-0-0 | 3 | 3 |
| | | 23CTL44D | Cybercrime Forensics and Digital Forensics | 2-1-0-0 | 3 | 3 |

**PROGRAMME ELECTIVE V**

| Slot | Category Code | Course Number | Courses | L-T-P-J | Hours | Credit |
|---|---|---|---|---|---|---|
| B | PEC | 23CTL45A | AI for Health Care | 2-1-0-0 | 3 | 3 |
| | | 23CTL45B | Big Data and Database Management | 2-1-0-0 | 3 | 3 |
| | | 23CSL45A | Cognitive Modelling | 2-1-0-0 | 3 | 3 |
| | | 23CTL45C | Time Series Analysis & Forecasting | 2-1-0-0 | 3 | 3 |

**PROGRAMME ELECTIVE VI**

| Slot | Category Code | Course Number | Courses | L-T-P-J | Hours | Credit |
|---|---|---|---|---|---|---|
| C | PEC | 23CTL46A | Data Compression Techniques | 2-1-0-0 | 3 | 3 |
| | | 23CTL46B | Game Theory in Artificial Intelligence | 2-0-0-0 | 3 | 3 |
| | | 23CTL46C | Machine Learning models and Storage Management | 2-1-0-0 | 3 | 3 |
| | | 23CTL46D | Applied Cryptography | 2-1-0-0 | 3 | 3 |
| | | 23CSL46A | Bio-Inspired Optimization Techniques | 2-1-0-0 | 3 | 3 |
| | | 23CSL46F | Quantum Computing | 2-1-0-0 | 3 | 3 |

**INSTITUTE ELECTIVE**

| Slot | Category Code | Course Number | Courses | L-T-P-J | Hours | Credit |
|---|---|---|---|---|---|---|
| C | IEC | 23IEL31X | Big Data Analytics | 2-1-0-0 | 3 | 3 |
| | | 23IEL31X | Introduction to AI and ML | 2-1-0-0 | 3 | 3 |
| | | 23IEL31X | Web Technology | 2-1-0-0 | 3 | 3 |
| | | 23IEL31X | Data Science | 2-1-0-0 | 3 | 3 |
| | | 23IEL31X | Natural Language Processing | 2-1-0-0 | 3 | 3 |

## MINOR

| Semester | Basket I Specialization: Data Science | | | | Basket II Specialization: Network Security | | | |
|---|---|---|---|---|---|---|---|---|
| | Course Number | Course | L-T-P-J | Credit | Course Number | Course | L-T-P-J | Credit |
| **S3** | 23CTL2MA | Statistical Machine Learning | 3-0-0-0 | 3 | 23CTL2MB | Intrusion Detection and Prevention System | 3-0-0-0 | 3 |
| **S4** | 23CTL2MC | Data Visualization & Presentation | 3-0-0-0 | 3 | 23CTL2MD | Cyber Security | 3-0-0-0 | 3 |
| **S5** | 23CTL3MA | Time Series Analysis & Forecasting | 3-0-0-0-0 | 3 | 23CTL3MB | Introduction to Blockchain technologies | 3-0-0-0 | 3 |
| **S6** | 23CTL3MC | Social Network Analysis | 3-0-0-0 | 3 | 23CTL3MD | Privacy and security in IoT | 3-0-0-0 | 3 |
| **S7** | 23CTJ4MA | Mini Project | 0-0-6-0 | 3 | 23CTJ4MA | Mini Project | 0-0-6-0 | 3 |
| **S8** | 23CTJ4MB | Mini Project | 0-0-6-0 | 3 | 23CTJ4MB | Mini Project | 0-0-6-0 | 3 |

## HONOURS

| Semester | Basket I Specialization: SECURITY IN COMPUTING | | | | Basket II Specialization: COMPUTATIONAL BIOLOGY | | | | Basket III Specialization: COMPUTER VISION | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Course Number | Course | L-T-P-J | Credit | Course Number | Course | L-T-P-J | Credit | Course Number | Course | L-T-P-J | Credit |
| S4 | 23CSL2HA | Number Theory | 3-0-0-0 | 3 | 23CTL2HA | Computational Fundamentals for Bioinformatics | 3-0-0-0 | 3 | 23CTL2HB | Advanced Topics in Computer Graphics | 3-0-0-0 | 3 |
| S5 | 23CSL3HA | Cryptographic Algorithms | 3-0-0-0 | 3 | 23CTL3HA | ComputationalBiology | 3-0-0-0 | 3 | 23CTL3HB | Advanced Concepts In Computer Vision | 3-0-0-0 | 3 |
| S6 | 23CSL3HD | Network Security | 3-0-0-0 | 3 | 23CTL3HC | Machine Learning in Computational Biology | 3-0-0-0 | 3 | 23CTL3HD | Image And Video Processing | 3-0-0-0 | 3 |
| S7 | 23CSL4HA | Cyber Forensics | 3-0-0-0 | 3 | 23CTL4HA | Computational Health Informatics | 3-0-0-0 | 3 | 23CTL4HB | Surveillance Video Analytics | 3-0-0-0 | 3 |
| S8 | 23CTJ4HA | Mini Project | 0-0-6-0 | 3 | 23CTJ4HA | Mini Project | 0-0-6-0 | 3 | 23CTJ4HA | Mini Project | 0-0-6-0 | 3 |