

**Computer Science and Engineering****CURRICULUM FROM SEMESTERS I TO VIII**

Every course of B. Tech. Programme shall be placed in one of the nine categories as listed in table below.

| Sl. No | Category  | Code | Credits    |
|--------|---|------|------------|
| 1      | Humanities and Social Sciences including Management courses | HMC  | 5          |
| 2      | Basic Science courses                                       | BSC  | 26         |
| 3      | Engineering Science Courses                                 | ESC  | 22         |
| 4      | Program Core Courses  | PCC  | 79         |
| 5      | Program Elective Courses                                    | PEC  | 15         |
| 6      | Open Elective Courses                                       | OEC  | 3          |
| 7      | Project work and Seminar                                    | PWS  | 10         |
| 8      | Mandatory Non-credit Courses (P/F) with grade               | MNC  | --         |
| 9      | Mandatory Student Activities (P/F)                          | MSA  | 2          |
|        | <b>Total Mandatory Credits</b>                              |      | <b>162</b> |
| 10     | Value Added Course (Optional)                               | VAC  | 20         |

No semester shall have more than five lecture-based courses and two laboratory and/or drawing/seminar/project courses in the curriculum. Semester-wise credit distribution shall be as below:

| Sem                  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | Total      |
|----------------------|----|----|----|----|----|----|----|----|------------|
| Credits              | 17 | 21 | 22 | 22 | 23 | 23 | 15 | 17 | 160        |
| Activity Points      | 50 |    |    |    | 50 |    |    |    | ---        |
| Credits for Activity | 2  |    |    |    |    |    |    |    | 2          |
| G.Total              |    |    |    |    |    |    |    |    | <b>162</b> |

**Basic Science Courses:** Maths, Physics, Chemistry, Biology for Engineers, Life Science etc

**Engineering Science Courses:** Engineering Graphics, Programming in C, Basics of Electrical and Electronics Engineering, Basics of Civil and Mechanical Engineering,

## COMPUTER SCIENCE AND ENGINEERING

Engineering Mechanics, Thermodynamics, Design Engineering, Materials Engineering, Workshops etc.

**Humanities and Social Sciences including Management courses:** English, Humanities, Professional Ethics, Management, Finance & Accounting, Life Skills, Professional Communication, Economics etc

**Mandatory Non-credit Courses:** Environmental Science, Constitution of India/Essence of Indian Knowledge Tradition, Industrial Safety Engineering, Disaster Management etc.

### Course Code and Course Number

Each course is denoted by a unique code consisting of three alphabets followed by three numerals like **CSL 201**. The first two letter code refers to the department offering the course. CS stands for course in Computer Science & Engineering, course code MA refers to a course in Mathematics, course code ES refers to a course in Engineering Science etc. Third letter stands for the nature of the course as indicated in the following table.

| Code | Description  |
|------|--|
| T    | Theory based courses (other than lecture hours, these courses can have tutorial and practical hours, e.g., L-T-P structures 3-0-0, 3-1-2, 3-0-2 etc.)              |
| L    | Laboratory based courses (where performance is evaluated primarily on the basis of practical or laboratory work with LTP structures like 0-0-3, 1-0-3, 0-1-3 etc.) |
| N    | Non-credit courses   |
| D    | Project based courses (Major-, Mini- Projects)   |
| Q    | Seminar courses  |

Course Number is a three digit number and the first digit refers to the Academic year in which the course is normally offered, i.e. 1, 2, 3, or 4 for the B. Tech. Programme of four year duration. Of the other two digits, the last digit identifies whether the course is offered normally in the odd (odd number), even (non-zero even number) or in both the semesters (zero). The middle number could be any digit. CSL 201 is a laboratory course offered in Computer Science and Engineering department for third semester, MAT 101 is a course in Mathematics offered in the first semester, EET 344 is a theory course in Electrical Engineering offered in the sixth semester, PHT 110 is a course in Physics offered both the first and second semesters, EST 102 is a course in Basic Engineering offered by one or many departments in the second semester. These course numbers are to be given in the curriculum and syllabi.

## Departments

Each course is offered by a Department and their two-letter course prefix is given in Table 2.

| Sl. No. | Department                            | Course Prefix | Sl. No. | Department                | Course Prefix |
|---------|---------------------------------------|---------------|---------|---------------------------|---------------|
| 1       | Aeronautical Engg                     | AO            | 16      | Information Technology    | IT            |
| 2       | Applied Electronics & Instrumentation | AE            | 17      | Instrumentation & Control | IC            |
| 3       | Automobile                            | AU            | 18      | Mandatory Courses         | MC            |
| 4       | Biomedical Engg                       | BM            | 19      | Mathematics               | MA            |
| 5       | Biotechnology                         | BT            | 20      | Mechanical Engg           | ME            |
| 6       | Chemical Engg                         | CH            | 21      | Mechatronics              | MR            |
| 7       | Chemistry                             | CY            | 22      | Metallurgy                | MT            |
| 8       | Civil Engg                            | CE            | 23      | Mechanical (Auto)         | MU            |
| 9       | Computer Science                      | CS            | 24      | Mechanical (Prod)         | MP            |
| 10      | Electrical & Electronics              | EE            | 25      | Naval & Ship Building     | SB            |
| 11      | Electronics & Biomedical              | EB            | 26      | Physics                   | PH            |
| 12      | Electronics & Communication           | EC            | 27      | Polymer Engg              | PO            |
| 13      | Food Technology                       | FT            | 28      | Production Engg           | PE            |
| 14      | Humanities                            | HU            | 29      | Robotics and Automation   | RA            |
| 15      | Industrial Engg                       | IE            | 30      | Safety & Fire Engg        | FS            |

## SEMESTER I

| SLOT         | COURSE NO. | COURSES   | L-T-P | HOURS        | CREDIT    |
|--------------|------------|---|-------|--------------|-----------|
| A            | MAT 101    | LINEAR ALGEBRA AND CALCULUS   | 3-1-0 | 4            | 4         |
| B<br>1/2     | PHT 100    | ENGINEERING PHYSICS A   | 3-1-0 | 4            | 4         |
|              | CYT 100    | ENGINEERING CHEMISTRY   | 3-1-0 | 4            | 4         |
| C<br>1/2     | EST 100    | ENGINEERING MECHANICS   | 2-1-0 | 3            | 3         |
|              | EST 110    | ENGINEERING GRAPHICS  | 2-0-2 | 4            | 3         |
| D<br>1/2     | EST 120    | B A S I C S O F C I V I L & M E C H A N I C A L ENGINEERING             | 4-0-0 | 4            | 4         |
|              | EST 130    | B A S I C S O F E L E C T R I C A L & E L E C T R O N I C S ENGINEERING | 4-0-0 | 4            | 4         |
| E            | HUN 101    | LIFE SKILLS   | 2-0-2 | 4            | --        |
| S<br>1/2     | PHL 120    | ENGINEERING PHYSICS LAB   | 0-0-2 | 2            | 1         |
|              | CYL 120    | ENGINEERING CHEMISTRY LAB   | 0-0-2 | 2            | 1         |
| T<br>1/2     | ESL 120    | CIVIL & MECHANICAL WORKSHOP   | 0-0-2 | 2            | 1         |
|              | ESL 130    | E L E C T R I C A L & ELECTRONICS WORKSHOP                              | 0-0-2 | 2            | 1         |
| <b>TOTAL</b> |            |   |       | <b>23/24</b> | <b>17</b> |

SEMESTER II

| SLOT         | COURSE NO. | COURSES  | L-T-P | HOURS        | CREDIT    |
|--------------|------------|--|-------|--------------|-----------|
| A            | MAT 102    | VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS | 3-1-0 | 4            | 4         |
| B<br>1/2     | PHT 100    | ENGINEERING PHYSICS A                                  | 3-1-0 | 4            | 4         |
|              | CYT 100    | ENGINEERING CHEMISTRY                                  | 3-1-0 | 4            | 4         |
| C<br>1/2     | EST 100    | ENGINEERING MECHANICS                                  | 2-1-0 | 3            | 3         |
|              | EST 110    | ENGINEERING GRAPHICS                                   | 2-0-2 | 4            | 3         |
| D<br>1/2     | EST 120    | BASICS OF CIVIL & MECHANICAL ENGINEERING               | 4-0-0 | 4            | 4         |
|              | EST 130    | BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING         | 4-0-0 | 4            | 4         |
| E            | HUT 102    | PROFESSIONAL COMMUNICATION                             | 2-0-2 | 4            | --        |
| F            | EST 102    | PROGRAMMING IN C                                       | 2-1-2 | 5            | 4         |
| S<br>1/2     | PHL 120    | ENGINEERING PHYSICS LAB                                | 0-0-2 | 2            | 1         |
|              | CYL 120    | ENGINEERING CHEMISTRY LAB                              | 0-0-2 | 2            | 1         |
| T<br>1/2     | ESL 120    | CIVIL & MECHANICAL WORKSHOP                            | 0-0-2 | 2            | 1         |
|              | ESL 130    | ELECTRICAL & ELECTRONICS WORKSHOP                      | 0-0-2 | 2            | 1         |
| <b>TOTAL</b> |            |  |       | <b>28/29</b> | <b>21</b> |

**NOTE:**

1. Engineering Physics A and Engineering Chemistry shall be offered in both semesters. Institutions can advise students belonging to about 50% of the number of branches in the Institution to opt for Engineering Physics A in S1 and Engineering Chemistry in S2 & vice versa. Students opting for Engineering Physics A in a semester should attend Physics Lab in the same semester and students opting for Engineering Chemistry in one semester should attend Engineering Chemistry Lab in the same semester
2. Engineering Mechanics and Engineering Graphics shall be offered in both semesters. Institutions can advise students belonging to about 50% of the number of branches in the Institution to opt for Engineering Mechanics in S1 and Engineering Graphics in S2 & vice versa.
3. Basics of Civil & Mechanical Engineering and Basics of Electrical & Electronics Engineering shall be offered in both semesters. Basics of Civil & Mechanical Engineering contain equal weightage for Civil Engineering and Mechanical Engineering. Slot for the course is D with CIE marks of 25 each and ESE marks of 50 each. Students belonging to branches of AEI, EI, BME, ECE, EEE, ICE, CSE, IT, RA can choose this course in S1.

Basics of Electrical & Electronics Engineering contain equal weightage for Electrical Engineering and Electronics Engineering. Slot for the course is D with CIE marks of 25 each and ESE marks of 50 each. Students belonging to AERO, AUTO, CE, FSE, IE, ME, MECHATRONICS, PE, METALLURGY, BT, BCE, CHEM, FT, POLY can choose this course in S1. Students having Basics of Civil & Mechanical Engineering in one semester should attend Civil & Mechanical Workshop in the same semester and students having Basics of Electrical & Electronics Engineering in a semester should attend Electrical & Electronics Workshop in the same semester.

#### 4. LIFE SKILLS

Life skills are those competencies that provide the means for an individual to be resourceful and positive while taking on life's vicissitudes. Development of one's personality by being aware of the self, connecting with others, reflecting on the abstract and the concrete, leading and generating change, and staying rooted in time-tested values and principles is being aimed at. This course is designed to enhance the employability and maximize the potential of the students by introducing them to the principles that underlie personal and professional success, and help them acquire the skills needed to apply these principles in their lives and careers.

#### 5. PROFESSIONAL COMMUNICATION

Objective is to develop in the under-graduate students of engineering a level of competence in English required for independent and effective communication for their professional needs. Coverage: Listening, Barriers to listening, Steps to overcome them, Purposive listening

**COMPUTER SCIENCE AND ENGINEERING**

practice, Use of technology in the professional world. Speaking, Fluency & accuracy in speech, Positive thinking, Improving self-expression, Tonal variations, Group discussion practice, Reading, Speed reading practice, Use of extensive readers, Analytical and critical reading practice, Writing Professional Correspondence, Formal and informal letters, Tone in formal writing, Introduction to reports. Study Skills, Use of dictionary, thesaurus etc., Importance of contents page, cover & back pages, Bibliography, Language Lab.

**SEMESTER III**

| SLOT   | COURSE NO. | COURSES                                   | L-T-P | HOURS      | CREDIT       |
|--|------------|---|-------|------------|--------------|
| A  | MAT 203    | DISCRETE MATHEMATICAL STRUCTURES          | 3-1-0 | 4          | 4            |
| B  | CST 201    | DATA STRUCTURES                           | 3-1-0 | 4          | 4            |
| C  | CST 203    | LOGIC SYSTEM DESIGN                       | 3-1-0 | 4          | 4            |
| D  | CST 205    | OBJECT ORIENTED PROGRAMMING USING JAVA    | 3-1-0 | 4          | 4            |
| E<br>(1/2)   | EST 200    | DESIGN & ENGINEERING                      | 2-0-0 | 2          | 2            |
|  | HUT 200    | PROFESSIONAL ETHICS                       | 2-0-0 | 2          | 2            |
| F  | MNC 201    | SUSTAINABLE ENGINEERING                   | 2-0-0 | 2          | --           |
| S  | CSL 201    | DATA STRUCTURES LAB                       | 0-0-3 | 3          | 2            |
| T  | CSL 203    | OBJECT ORIENTED PROGRAMMING LAB (IN JAVA) | 0-0-3 | 3          | 2            |
| R/M  | VAC        | Remedial/Minor course                     | 3-1-0 | 4          | 4            |
| <b>TOTAL</b>   |            |   |       | <b>26*</b> | <b>22/26</b> |
| * Excluding Hours to be engaged for Remedial/Minor course. |            |   |       |            |              |

## SEMESTER IV

| SLOT  | COURSE NO. | COURSES   | L-T-P | HOURS      | CREDIT       |
|---|------------|---|-------|------------|--------------|
| A   | MAT 206    | GRAPH THEORY  | 3-1-0 | 4          | 4            |
| B   | CST 202    | C O M P U T E R<br>O R G A N I S A T I O N A N D<br>A R C H I T E C T U R E | 3-1-0 | 4          | 4            |
| C   | CST 204    | DATABASE MANAGEMENT<br>SYSTEMS  | 3-1-0 | 4          | 4            |
| D   | CST 206    | OPERATING SYSTEMS   | 3-1-0 | 4          | 4            |
| E<br>(1/2)  | EST 200    | DESIGN & ENGINEERING  | 2-0-0 | 2          | 2            |
|   | HUT 200    | PROFESSIONAL ETHICS   | 2-0-0 | 2          | 2            |
| F   | MNC 202    | CONSTITUTION OF INDIA   | 2-0-0 | 2          | --           |
| S   | CSL 202    | DIGITAL LAB   | 0-0-3 | 3          | 2            |
| T   | CSL204     | OPERATING SYSTEMS LAB   | 0-0-3 | 3          | 2            |
| R/M/<br>H   | VAC        | Remedial/Minor/Honors course  | 3-1-0 | 4          | 4            |
| <b>TOTAL</b>  |            |   |       | <b>26*</b> | <b>22/26</b> |
| * Excluding Hours to be engaged for Remedial/Minor/Honors course. |            |   |       |            |              |

**NOTE:**

- Design & Engineering and Professional Ethics shall be offered in both S3 and S4. Institutions can advise students belonging to about 50% of the number of branches in the Institution to opt for Design & Engineering in S3 and Professional Ethics in S4 & vice versa.
- \*All Institutions should keep 4 hours exclusively for Remedial class/Minor course (Thursdays from 3 to 5 PM and Fridays from 2 to 4 PM). If a student does not opt for minor programme, he/she can be given remedial class.



## SEMESTER V

| SLOT  | COURSE NO. | COURSES                                  | L-T-P | HOURS      | CREDIT       |
|---|------------|--|-------|------------|--------------|
| A   | CST 301    | FORMAL LANGUAGES AND AUTOMATA THEORY     | 3-1-0 | 4          | 4            |
| B   | CST 303    | COMPUTER NETWORKS                        | 3-1-0 | 4          | 4            |
| C   | CST 305    | SYSTEM SOFTWARE                          | 3-1-0 | 4          | 4            |
| D   | CST 307    | MICROPROCESSORS AND MICROCONTROLLERS     | 3-1-0 | 4          | 4            |
| E   | CST 309    | M A N A G E M E N T O F SOFTWARE SYSTEMS | 3-0-0 | 3          | 3            |
| F   | MNC 301    | DISASTER MANAGEMENT                      | 2-0-0 | 2          | --           |
| S   | CSL 331    | SYSTEM SOFTWARE AND MICROPROCESSORS LAB  | 0-0-4 | 4          | 2            |
| T   | CSL 333    | DATABASE MANAGEMENT SYSTEMS LAB          | 0-0-4 | 4          | 2            |
| R/M/<br>H   | VAC        | Remedial/Minor/Honors course*            | 2-0-0 | 4          | 4            |
| <b>TOTAL</b>  |            |  |       | <b>29*</b> | <b>23/27</b> |
| * Excluding Hours to be engaged for Remedial/Minor/Honors course. |            |  |       |            |              |

## NOTE:

1. \*All Institutions should keep 4 hours exclusively for Remedial class/Minor/ Honors course (Tuesdays from 3 to 5 PM and Wednesdays from 3 to 5 PM). If a student does not opt for minor/honors programme, he/she can be given remedial class.

## SEMESTER VI

| SLOT  | COURSE NO. | COURSES                                | L-T-P | HOURS | CREDIT       |
|---|------------|--|-------|-------|--------------|
| A   | CST 302    | COMPILER DESIGN                        | 3-1-0 | 4     | 4            |
| B   | CST 304    | COMPUTER GRAPHICS AND IMAGE PROCESSING | 3-1-0 | 4     | 4            |
| C   | CST 306    | ALGORITHM ANALYSIS AND DESIGN          | 3-1-0 | 4     | 4            |
| D   | CST ---    | PROGRAM ELECTIVE I                     | 2-1-0 | 3     | 3            |
| E   | HUT 300    | INDUSTRIAL ECONOMICS & FOREIGN TRADE   | 3-0-0 | 3     | 3            |
| F   | CST 308    | COMPREHENSIVE COURSE WORK              | 1-0-0 | 1     | 1            |
| S   | CSL 332    | NETWORKING LAB                         | 0-0-3 | 3     | 2            |
| T   | CSD 334    | MINIPROJECT                            | 0-0-3 | 3     | 2            |
| R/M/H   | VAC        | Remedial/Minor/Honors course*          | 3-1-0 | 4     | 4            |
| <b>TOTAL</b>  |            |  |       | 25*   | <b>23/27</b> |
| * Excluding Hours to be engaged for Remedial/Minor/Honors course. |            |  |       |       |              |

**Note:**

**Electives:** This curriculum envisages to offer a learner an opportunity to earn proficiency in one of the five trending areas in Computer Science, namely Machine Learning, Data Science, Security in Computing, Formal Methods in Software Engineering and Hardware Technologies. Three courses each from the above areas are included through Elective Courses in different Elective Buckets. For example, a learner who is interested in the *Machine Learning* area may opt to take the elective courses - *Foundations of Machine Learning* from Elective-I in S6, *Machine Learning* from Elective-II in S7 and *Deep Learning* from Elective-III in S8. The Department may offer Elective Courses to enable students to utilize this opportunity, depending on the availability of faculty. The courses included from these areas under various Elective Buckets are shown in the table below.

| Different Specializations introduced through various Elective Buckets |  |  |   |  |
|---|--|--|---|--|
| Bucket  | Specialisation                         | Semester                                   |   |  |
|   |  | S6   | S7  | S8   |
| 1   | Machine Learning                       | FOUNDATIONS OF MACHINE LEARNING (E-I)      | MACHINE LEARNING (E-II)                     | DEEP LEARNING (E-III)                      |
| 2   | Data Science                           | DATA ANALYTICS (E-I)                       | CLOUD COMPUTING (E-II)                      | BLOCK CHAIN TECHNOLOGIES (E-V)             |
| 3   | Security in Computing                  | FOUNDATIONS OF SECURITY IN COMPUTING (E-I) | SECURITY IN COMPUTING (E-II)                | CRYPTOGRAPHY (E-III)                       |
| 4   | Formal Methods in Software Engineering | AUTOMATED VERIFICATION (E-I)               | MODEL BASED SOFTWARE DEVELOPMENT (E-II)     | SOFTWARE TESTING (E-V)                     |
| 5   | Hardware Technologies                  | INTRODUCTION TO IA32 ARCHITECTURE (E-I)    | ADVANCED TOPICS IN IA32 ARCHITECTURE (E-II) | UNIFIED EXTENDED FIRMWARE INTERFACE (E-IV) |

**PROGRAM ELECTIVE I**

| SLOT | COURSE NO. | COURSES                                  | L-T-P | HOURS | CREDIT |
|------|------------|--|-------|-------|--------|
| D    | CST 312    | i FOUNDATIONS OF MACHINE LEARNING        | 2-1-0 | 3     | 3      |
|      | CST 322    | ii DATA ANALYTICS                        | 2-1-0 |       |        |
|      | CST 332    | iii FOUNDATIONS OF SECURITY IN COMPUTING | 2-1-0 |       |        |
|      | CST 342    | iv AUTOMATED VERIFICATION                | 2-1-0 |       |        |
|      | CST 352    | v INTRODUCTION TO IA32 ARCHITECTURE      | 2-1-0 |       |        |
|      | CST 362    | vi PROGRAMMING IN PYTHON                 | 2-1-0 |       |        |
|      | CST 372    | vii DATA AND COMPUTER COMMUNICATION      | 2-1-0 |       |        |

**COURSES TO BE CONSIDERED FOR COMPREHENSIVE COURSE WORK**

|   |
|---|
| I DISCRETE MATHEMATICAL STRUCTURES        |
| ii DATA STRUCTURES                        |
| iii OPERATING SYSTEMS                     |
| iv COMPUTER ORGANIZATION AND ARCHITECTURE |
| v DATABASE MANAGEMENT SYSTEMS             |
| vi FORMAL LANGUAGES AND AUTOMATA THEORY   |

**NOTE:**

1. \*All Institutions should keep 4 hours exclusively for Remedial class/Minor/Honors course (Tuesdays from 3 to 5 PM and Wednesdays from 2 to 4 PM). If a student does not opt for minor/honors programme, he/she can be given remedial class.
2. **Comprehensive Course Work:** The comprehensive course work in the sixth semester of study shall have a written test of 50 marks. The written examination will be of objective type similar to the GATE examination and will be conducted by the University. Syllabus for comprehensive examination shall be prepared by the respective BoS choosing the above listed 6 core courses studied from semesters 3 to 5. The pass minimum for this course is 25. The course should be mapped with a faculty and classes shall be arranged for practicing questions based on the core courses listed in the curriculum.
3. **Mini project:** It is introduced in the sixth semester with a specific objective to strengthen the understanding of student's fundamentals through effective application of theoretical concepts. Mini project can help to boost their skills and widen the horizon of their thinking. The ultimate aim of an engineering student is to resolve a problem by applying theoretical knowledge. Doing more projects increases problem-solving skills. Student Groups with 3 or 4 members should identify a topic of interest in consultation with Faculty/Advisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design/fabrication or develop codes/programs to achieve the objectives. Demonstrate the novelty of the project through the results and outputs. The progress of the mini project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The product has to be

**COMPUTER SCIENCE AND ENGINEERING**

demonstrated for its full design specifications. Innovative design concepts, reliability considerations, aesthetics/ergonomic aspects taken care of in the project shall be given due weight. The internal evaluation will be made based on the product, the report and a viva-voce examination, conducted internally by a 3 member committee appointed by Head of the Department comprising HoD or a senior faculty member, Mini Project coordinator for that program and project guide.

Total marks: 150 - CIE 75 marks and ESE 75 marks

Split up for CIE

|                |    |
|----------------|----|
| Attendance     | 10 |
| Project Guide  | 15 |
| Project Report | 10 |

|  |    |
|--|----|
| Evaluation by the Committee (will be evaluating the level of completion and demonstration of functionality/specifications, presentation, oral examination, work knowledge and involvement) | 40 |
|--|----|

**SEMESTER VII**

| SLOT  | COURSE NO. | COURSES                       | L-T-P | HOURS      | CREDIT       |
|---|------------|-------------------------------|-------|------------|--------------|
| A   | CST 401    | ARTIFICIAL INTELLIGENCE       | 2-1-0 | 3          | 3            |
| B   | CST ---    | PROGRAM ELECTIVE II           | 2-1-0 | 3          | 3            |
| C   | CST ---    | OPEN ELECTIVE                 | 2-1-0 | 3          | 3            |
| D   | MNC 401    | INDUSTRIAL SAFETY ENGINEERING | 2-1-0 | 3          | ---          |
| S   | CSL 411    | COMPILER LAB                  | 0-0-3 | 3          | 2            |
| T   | CSQ 413    | SEMINAR                       | 0-0-3 | 3          | 2            |
| U   | CSD 415    | PROJECT PHASE I               | 0-0-6 | 6          | 2            |
| R/M/<br>H   | VAC        | Remedial/Minor/Honors course* | 3-1-0 | 4          | 4            |
| <b>TOTAL</b>  |            |                               |       | <b>24*</b> | <b>15/19</b> |
| * Excluding Hours to be engaged for Remedial/Minor/Honors course. |            |                               |       |            |              |

## PROGRAM ELECTIVE II

| SLOT | COURSE NO. | COURSES                                | L-T-P | HOURS | CREDIT |
|------|------------|--|-------|-------|--------|
| B    | CST 413    | i MACHINE LEARNING                     | 2-1-0 | 3     | 3      |
|      | CST 423    | ii CLOUD COMPUTING                     | 2-1-0 |       |        |
|      | CST 433    | iii SECURITY IN COMPUTING              | 2-1-0 |       |        |
|      | CST 443    | iv MODEL BASED SOFTWARE DEVELOPMENT    | 2-1-0 |       |        |
|      | CST 453    | v ADVANCED TOPICS IN IA32 ARCHITECTURE | 2-1-0 |       |        |
|      | CST 463    | vi WEB PROGRAMMING                     | 2-1-0 |       |        |
|      | CST 473    | vii NATURAL LANGUAGE PROCESSING        | 2-1-0 |       |        |

## OPEN ELECTIVE

The open elective is offered in semester 7. Each program should specify the courses (maximum 5) they would like to offer as electives for other programs. The courses listed below are offered by the Department of **COMPUTER SCIENCE & ENGINEERING** for students of other undergraduate branches except Computer Science & Engineering and Information Technology, offered in the colleges under KTU.

| SLOT | COURSE NO. | COURSES                            | L-T-P | HOURS | CREDIT |
|------|------------|------------------------------------|-------|-------|--------|
| B    | CST 415    | i INTRODUCTION TO MOBILE COMPUTING | 2-1-0 | 3     | 3      |
|      | CST 425    | ii INTRODUCTION TO DEEP LEARNING   | 2-1-0 |       |        |
|      | CST 435    | iii COMPUTER GRAPHICS              | 2-1-0 |       |        |
|      | CST 445    | iv PYTHON FOR ENGINEERS            | 2-1-0 |       |        |
|      | CST 455    | v OBJECT ORIENTED CONCEPTS         | 2-1-0 |       |        |

**NOTE:**

1. All Institutions should keep 4 hours exclusively for Remedial class/Minor/Honors course (Mondays from 10 to 12 and Wednesdays from 10 to 12 Noon). If a student does not opt for minor/honors programme, he/she can be given remedial class.
2. Seminar: To encourage and motivate the students to read and collect recent and reliable information about their area of interest confined to the relevant discipline, from technical publications including peer reviewed journals, conferences, books, project reports etc., prepare a report based on a central theme and present it before a peer audience. Each student shall present the seminar for about 20 minutes duration on the selected topic. The report and the presentation shall be evaluated by a team of faculty members comprising Academic coordinator for that program, seminar coordinator and seminar guide based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the report.

Total marks: 100, only CIE, minimum required to pass 50

|                                 |    |
|---------------------------------|----|
| Attendance                      | 10 |
| Seminar Guide                   | 20 |
| Technical Content of the Report | 30 |
| Presentation                    | 40 |

3. Project Phase-I: A Project topic must be selected either from research literature or the students themselves may propose suitable topics in consultation with their guides. The objective of Project Work Phase-I is to enable the student to take up investigative study in the broad field of Computer Science and Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on a group of three/four students, under the mentoring of a Project Guide(s). This is expected to provide a good initiation for the student(s) in R&D work. The assignment shall normally include:
  - Survey and study of published literature on the assigned topic;
  - Preparing an Action Plan for conducting the investigation, including team work;
  - Working out a preliminary Approach to the Problem relating to the assigned topic;
  - Block level design documentation
  - Conducting preliminary Analysis/ Modelling/ Simulation/ Experiment/ Design/ Feasibility;

**COMPUTER SCIENCE AND ENGINEERING**

- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final project presentation before the concerned departmental committee.

Total marks: 100, only CIE, minimum required to pass 50

|  |    |
|--|----|
| Project Guide(s)                               | 30 |
| Interim evaluation by the evaluation committee | 20 |
| Final project presentation                     | 30 |
| Final evaluation by the evaluation committee   | 20 |

The evaluation committee comprises HoD or a senior faculty member, Project coordinator and project guide(s).

**SEMESTER VIII**

| SLOT  | COURSE NO. | COURSES                      | L-T-P  | HOURS      | CREDIT       |
|---|------------|------------------------------|--------|------------|--------------|
| A   | CST 402    | DISTRIBUTED COMPUTING        | 2-1-0  | 3          | 3            |
| B   | CST ---    | PROGRAM ELECTIVE III         | 2-1-0  | 3          | 3            |
| C   | CST ---    | PROGRAM ELECTIVE IV          | 2-1-0  | 3          | 3            |
| D   | CST ---    | PROGRAM ELECTIVE V           | 2-1-0  | 3          | 3            |
| T   | CST 404    | COMPREHENSIVE COURSE VIVA    | 1-0-0  | 1          | 1            |
| U   | CSD 416    | PROJECT PHASE II             | 0-0-12 | 12         | 4            |
| R/M/<br>H   | VAC        | Remedial/Minor/Honors course | 3-1-0  | 4          | 4            |
| <b>TOTAL</b>  |            |                              |        | <b>25*</b> | <b>17/21</b> |
| * Excluding Hours to be engaged for Remedial/Minor/Honors course. |            |                              |        |            |              |



## PROGRAM ELECTIVE III

| SLOT | COURSE NO. | COURSES                             | L-T-P | HOURS | CREDIT |
|------|------------|-------------------------------------|-------|-------|--------|
| B    | CST 414    | i DEEP LEARNING                     | 2-1-0 | 3     | 3      |
|      | CST 424    | ii PROGRAMMING PARADIGMS            | 2-1-0 |       |        |
|      | CST 434    | iii CRYPTOGRAPHY                    | 2-1-0 |       |        |
|      | CST 444    | iv SOFT COMPUTING                   | 2-1-0 |       |        |
|      | CST 454    | v FUZZY SET THEORY AND APPLICATIONS | 2-1-0 |       |        |
|      | CST 464    | vi EMBEDDED SYSTEMS                 | 2-1-0 |       |        |
|      | CST 474    | vii COMPUTER VISION                 | 2-1-0 |       |        |

## PROGRAM ELECTIVE IV

| SLOT | COURSE NO. | COURSES  | L-T-P | HOURS | CREDIT |
|------|------------|--|-------|-------|--------|
| C    | CST 416    | i FORMAL METHODS AND TOOLS IN SOFTWARE ENGINEERING | 2-1-0 | 3     | 3      |
|      | CST 426    | ii CLIENT SERVER ARCHITECTURE                      | 2-1-0 |       |        |
|      | CST 436    | iii PARALLEL COMPUTING                             | 2-1-0 |       |        |
|      | CST 446    | iv DATA COMPRESSION TECHNIQUES                     | 2-1-0 |       |        |
|      | CST 456    | v UNIFIED EXTENDED FIRMWARE INTERFACE              | 2-1-0 |       |        |
|      | CST 466    | vi DATA MINING                                     | 2-1-0 |       |        |
|      | CST 476    | vii MOBILE COMPUTING                               | 2-1-0 |       |        |

## PROGRAM ELECTIVE V

| SLOT | COURSE NO. | COURSES                        | L-T-P | HOURS | CREDIT |
|------|------------|--------------------------------|-------|-------|--------|
| D    | CST 418    | i HIGH PERFORMANCE COMPUTING   | 2-1-0 | 3     | 3      |
|      | CST 428    | ii BLOCK CHAIN TECHNOLOGIES    | 2-1-0 |       |        |
|      | CST 438    | iii IMAGE PROCESSING TECHNIQUE | 2-1-0 |       |        |
|      | CST 448    | iv INTERNET OF THINGS          | 2-1-0 |       |        |
|      | CST 458    | v SOFTWARE TESTING             | 2-1-0 |       |        |
|      | CST 468    | vi BIOINFORMATICS              | 2-1-0 |       |        |
|      | CST 478    | vii COMPUTATIONAL LINGUISTICS  | 2-1-0 |       |        |

## NOTE:

- \*All Institutions should keep 4 hours exclusively for Remedial class/Minor/Honors course (Mondays from 10 to 12 and Wednesdays from 10 to 12 PM). If a student does not opt for minor/honors programme, he/she can be given remedial class.
- Comprehensive Viva Voce:** The comprehensive viva voce in the eighth semester of study shall have a viva voce for 50 marks. The viva voce shall be conducted based on the core subjects studied from third to eighth semester. The viva voce will be conducted by the same three member committee assigned for final project phase II evaluation towards the end of the semesters. The pass minimum for this course is 25. The course should be mapped with a faculty and classes shall be arranged for practicing questions based on the core courses listed in the curriculum. The mark will be treated as internal and should be uploaded along with internal marks of other courses.
- Project Phase II:** The objective of Project Work Phase II & Dissertation is to enable the student to extend further the investigative study taken up in Project Phase I, either fully theoretical/practical or involving both theoretical and practical work, under the mentoring of a Project Guide from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment shall normally include:

- In depth study of the topic assigned in the light of the Report prepared in Phase I;
- Review and finalization of the Approach to the Problem relating to the assigned topic;
- Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed;
- Final development of product/process, testing, results, conclusions and future directions;
- Preparing a paper for Conference presentation/Publication in Journals, if possible;
- Preparing a Dissertation in the standard format for being evaluated by the Department;
- Final Presentation before the concerned evaluation committee

Total marks: 150, only CIE, minimum required to pass 75

Project Guide 30

Interim evaluation, twice in the semester by the evaluation committee 70

Quality of the report evaluated by the above committee 10

(The evaluation committee comprises HoD or a senior faculty member, Project coordinator and project guide).

Final evaluation by a three member committee 40

(The final evaluation committee comprises Project coordinator, expert from Industry/ research Institute and a senior faculty from a sister department. The same committee will conduct comprehensive course viva for 50 marks ).

## MINOR

Minor is an additional credential a student may earn if she/he does 20 credits worth of additional learning in a discipline other than her/his major discipline of B.Tech. degree. The objective is to permit a student to customize their Engineering degree to suit their specific interests. Upon completion of an Engineering Minor, a student will be better equipped to perform interdisciplinary research and will be better employable. Engineering Minors allow a student to gain interdisciplinary experience and exposure to concepts and perspectives that may not be a part of their major degree programs.

The academic units offering minors in their discipline will prescribe the set of courses and/or other activities like projects necessary for earning a minor in that discipline. A specialist bucket of 3-6 courses is identified for each Minor. Each bucket may rest on one or more

foundation courses. A bucket may have sequences within it, i.e., advanced courses may rest on basic courses in the bucket. She/he accumulates credits by registering for the required courses, and if the requirements for a particular minor are met within the time limit for the course, the minor will be awarded. This will be mentioned in the Degree Certificate as “Bachelor of Technology in xxx with Minor in yyy”. The fact will also be reflected in the consolidated grade card, along with the list of courses taken. If one specified course cannot be earned during the course of the programme, that minor will not be awarded. The individual course credits earned, however, will be reflected in the consolidated grade card.

(i) The curriculum/syllabus committee/BoS shall prepare syllabus for courses to be included in the curriculum from third to eight semesters for all branches. The minor courses shall be identified by M slot courses.

(ii) Registration is permitted for Minor at the beginning of third semester. Total credits required to award B.tech with Minor is 182 (162 + 20)

(iii) Out of the 20 Credits, 12 credits shall be earned by undergoing a minimum of three courses, of which one course shall be a mini project based on the chosen area. They can do miniproject either in S7 or in S8. The remaining 8 credits could be acquired through 2 MOOCs recommended by the Board of Studies and approved by the Academic Council or 2 courses from the minor buckets listed here. The classes for Minor shall be conducted along with regular classes and no extra time shall be required for conducting the courses.

(iv) There won't be any supplementary examination for the courses chosen for Minor.

(v) On completion of the program, “Bachelor of Technology in xxx with Minor in yyy” will be awarded if the registrant earn 20 credits form the minor courses.

(vi) The registration for minor program will commence from semester 3 and all the academic units offering minors in their discipline should prescribe set of such courses. The courses shall be grouped into maximum of 5 buckets. The bucket of courses may have sequences within it, i.e., advanced courses may rest on basic courses in the bucket. Reshuffling of courses between various buckets will not be allowed. There is option to skip any two courses listed here and to opt for equivalent MOOC courses approved by the Academic Council. In any case, they should carry out a mini project based on the chosen area in S7 or S8. For example: Students who have registered for **B.Tech Minor in Computer Science & Engineering** can opt to study the courses listed below:

| MINOR BUCKETS   |                                       |  |                       |                            |                                   |  |                       |                            |                             |   |                       |                            |
|---|---------------------------------------|--|-----------------------|----------------------------|-----------------------------------|--|-----------------------|----------------------------|-----------------------------|---|-----------------------|----------------------------|
| S<br>E<br>M<br>E<br>S<br>T<br>E<br>R  | BUCKET-1                              |  |                       |                            | BUCKET-2                          |  |                       |                            | BUCKET-3                    |   |                       |                            |
|   | Specialization - Software Engineering |  |                       |                            | Specialization - Machine Learning |  |                       |                            | Specialization - Networking |   |                       |                            |
|   | CO<br>UR<br>SE<br>NO                  | COURSE NAME                            | H<br>O<br>U<br>R<br>S | C<br>R<br>E<br>D<br>I<br>T | CO<br>UR<br>SE<br>NO              | COURSE NAME                                | H<br>O<br>U<br>R<br>S | C<br>R<br>E<br>D<br>I<br>T | CO<br>UR<br>SE<br>NO        | COURSE NAME   | H<br>O<br>U<br>R<br>S | C<br>R<br>E<br>D<br>I<br>T |
| S3  | CST<br>281                            | OBJECT<br>ORIENTED<br>PROGRAMMING      | 4                     | 4                          | CST<br>283                        | PYTHON FOR<br>MACHINE<br>LEARNING          | 4                     | 4                          | CST<br>285                  | DATA<br>COMMUNICAT<br>ION                           | 4                     | 4                          |
| S4  | CST<br>282                            | PROGRAMMING<br>METHODOLOGIE<br>S       | 4                     | 4                          | CST<br>284                        | MATHEMATIC<br>S FOR<br>MACHINE<br>LEARNING | 4                     | 4                          | CST<br>286                  | INTRODUCTIO<br>N TO<br>COMPUTER<br>NETWORKS         | 4                     | 4                          |
| S5  | CST<br>381                            | CONCEPTS IN<br>SOFTWARE<br>ENGINEERING | 4                     | 4                          | CST<br>383                        | CONCEPTS IN<br>MACHINE<br>LEARNING         | 4                     | 4                          | CST<br>385                  | CLIENT<br>SERVER<br>SYSTEMS                         | 4                     | 4                          |
| S6  | CST<br>382                            | INTRODUCTION<br>TO SOFTWARE<br>TESTING | 4                     | 4                          | CST<br>384                        | CONCEPTS IN<br>DEEP<br>LEARNING            | 4                     | 4                          | CST<br>386                  | WIRELESS<br>NETWORKS<br>AND IOT<br>APPLICATION<br>S | 4                     | 4                          |
| S7  | CSD<br>481                            | Miniproject                            | 4                     | 4                          | CSD<br>481                        | Miniproject                                | 4                     | 4                          | CSD<br>481                  | Miniproject   | 4                     | 4                          |
| S8  | CSD<br>482                            | Miniproject                            | 4                     | 4                          | CSD<br>482                        | Miniproject                                | 4                     | 4                          | CSD<br>482                  | Miniproject   | 4                     | 4                          |
| Note-1: Name of the specialization shall be mentioned in the Minor Degree to be awarded                                 |                                       |  |                       |                            |                                   |  |                       |                            |                             |   |                       |                            |
| Note-2: Any B.Tech students from non-Computer Science/non-IT streams can register for the courses in the minor buckets. |                                       |  |                       |                            |                                   |  |                       |                            |                             |   |                       |                            |

**HONORS**

Honors is an additional credential a student may earn if she/he opts for the extra 20 credits needed for this in her/his own discipline. Honors is not indicative of a class. The University is providing this option for academically extra brilliant students to acquire Honors. Honors is intended for a student to *gain expertise/get specialized* in an area inside his/her major B.Tech discipline and to enrich knowledge in emerging/advanced areas in the concerned branch of engineering. It is particularly suited for students aiming to pursue higher studies. Upon completion of Honors, a student will be better equipped to perform research in her/his branch of engineering. On successful accumulation of credits at the end of the programme, this will be mentioned in the Degree Certificate as “Bachelor of Technology in xxx, with Honors.” The fact will also be reflected in the consolidated grade card, along with the list of courses taken. If a student is not earning credits for any one of the specified course for getting Honors, she/he is not entitled to get Honors. The individual course credits earned, however, will be reflected in the consolidated grade card.

The courses shall be grouped into maximum of 3 buckets, each bucket representing a particular specialization in the branch. The students shall select only the courses from same bucket in all semesters. It means that the specialization is to be fixed by the student and cannot be changed subsequently. The internal evaluation, examination and grading shall be exactly as for other mandatory courses. The Honors courses shall be identified by H slot courses.

- (i) The curriculum/syllabus committee/BoS shall prepare syllabus for courses to be included in the curriculum from fourth to eight semesters for all branches. The Honors courses shall be identified by H slot courses.
- (ii) Registration is permitted for Honors at the beginning of fourth semester. Total credits required is 182 (162 + 20).
- (iii) Out of the 20 Credits, 12 credits shall be earned by undergoing a minimum of three courses, of which one course shall be a mini project based on the chosen area. The remaining 8 credits could be acquired through 2 MOOCs recommended by the Board of studies and approved by the Academic Council or 2 courses from the same bucket as the above 3 courses. The classes for Honors shall be conducted along with regular classes and no extra time shall be required for conducting the courses. The students should earn a grade of ‘C’ or better for all courses under Honors.
- (iv) There won’t be any supplementary examination for the courses chosen for Honors.
- (v) On successful accumulation of credits at the end of the programme, “Bachelor of Technology in xxx, with Honors” will be awarded if overall CGPA is greater than

or equal to 8.5, earned a grade of 'C' or better for all courses chosen for Honors and there is no history of 'F' Grade in the entire span of the BTech Course.

- (vi) The registration for Honors program will commence from semester 4 and the all academic units offering Honors in their discipline should prescribe set of such courses. The courses shall be grouped into maximum of 5 buckets, each bucket representing a particular specialization in the branch. The students shall select only the courses from same bucket in all semesters. It means that the specialization is to be fixed by the student and cannot be changed subsequently. There is option to skip any two courses listed here if required, and to opt for equivalent MOOC courses approved by the Academic Council. In any case, they should carry out a mini project based on the chosen area in S8. For example: Students who have registered for **B.Tech in Computer Science and Engineering with Honors** can opt to study the courses listed in one of the buckets shown below:

COMPUTER SCIENCE AND ENGINEERING

| HONORS BUCKETS                       |  |                             |                       |                                   |  |                       |                                 |   |                       |  |  |
|--------------------------------------|--|-----------------------------|-----------------------|-----------------------------------|--|-----------------------|---------------------------------|---|-----------------------|--|--|
| S<br>E<br>M<br>E<br>S<br>T<br>E<br>R | BUCKET-1                               |                             |                       | BUCKET-2                          |  |                       | BUCKET-3                        |   |                       |  |  |
|                                      | Specialization - Security in Computing |                             |                       | Specialization - Machine Learning |  |                       | Specialization - Formal Methods |   |                       |  |  |
|                                      | CO<br>UR<br>S<br>E<br>N<br>O           | COURSE NAME                 | H<br>O<br>U<br>R<br>S | CO<br>UR<br>S<br>E<br>N<br>O      | COURSE NAME  | H<br>O<br>U<br>R<br>S | CO<br>UR<br>S<br>E<br>N<br>O    | COURSE NAME   | H<br>O<br>U<br>R<br>S |  |  |
| S4                                   | CST<br>292                             | NUMBER<br>THEORY            | 4<br>4                | CST<br>294                        | COMPUTATIONAL<br>FUNDAMENTALS FOR<br>MACHINE<br>LEARNING | 4<br>4                | CST<br>296                      | PRINCIPLES<br>OF PROGRAM<br>ANALYSIS<br>AND<br>VERIFICATION | 4<br>4                |  |  |
| S5                                   | CST<br>393                             | CRYPTOGRAPHIC<br>ALGORITHMS | 4<br>4                | CST<br>395                        | NEURAL<br>NETWORKS<br>AND DEEP<br>LEARNING               | 4<br>4                | CST<br>397                      | PRINCIPLES<br>OF MODEL<br>CHECKING                          | 4<br>4                |  |  |
| S6                                   | CST<br>394                             | NETWORK<br>SECURITY         | 4<br>4                | CST<br>396                        | ADVANCED<br>TOPICS IN<br>MACHINE<br>LEARNING             | 4<br>4                | CST<br>398                      | THEORY OF<br>COMPUTABILITY AND<br>COMPLEXITY                | 4<br>4                |  |  |
| S7                                   | CST<br>495                             | CYBER<br>FORENSICS          | 4<br>4                | CST<br>497                        | ADVANCED<br>TOPICS IN<br>ARTIFICIAL<br>INTELLIGENCE      | 4<br>4                | CST<br>499                      | LOGIC FOR<br>COMPUTER<br>SCIENCE                            | 4<br>4                |  |  |
| S8                                   | CSD<br>496                             | Miniproject                 | 4<br>4                | CSD<br>496                        | Miniproject  | 4<br>4                | CSD<br>496                      | Miniproject   | 4<br>4                |  |  |

Note: Name of the specialization shall be mentioned in the Honors Degree to be awarded



**INDUCTION PROGRAM**

There will be three weeks induction program for first semester students. It is a unique three-week immersion Foundation Programme designed specifically for the fresher's which includes a wide range of activities right from workshops, lectures and seminars to sports tournaments, social works and much more. The programme is designed to mould students into well-rounded individuals, aware and sensitized to local and global conditions and foster their creativity, inculcate values and ethics, and help students to discover their passion. Foundation Programme also serves as a platform for the fresher's to interact with their batch-mates and seniors and start working as a team with them. The program is structured around the following five themes:

The programme is designed keeping in mind the following objectives:

- **Values and Ethics:** Focus on fostering a strong sense of ethical judgment and moral fortitude.
- **Creativity:** Provide channels to exhibit and develop individual creativity by expressing themselves through art, craft, music, singing, media, dramatics, and other creative activities.
- **Leadership, Communication and Teamwork:** Develop a culture of teamwork and group communication.
- **Social Awareness:** Nurture a deeper understanding of the local and global world and our place in it as concerned citizens of the world.
- **Physical Activities & Sports:** Engage students in sports and physical activity to ensure healthy physical and mental growth.