

## Curriculum for Undergraduate Degree (B.Tech.) in Computer Science and Engineering (Data Science) (w.e.f. AY: 2020-21)

### Part II: Course Structure & Semester wise Credit Distribution

| First Semester (First Year)                   |                                              |             |                                            |               |   |    |         |
|-----------------------------------------------|----------------------------------------------|-------------|--------------------------------------------|---------------|---|----|---------|
| Mandatory Induction Program- 3 Weeks Duration |                                              |             |                                            |               |   |    |         |
| Sl No.                                        | Category                                     | Course Code | Course Name                                | Contact Hours |   |    | Credits |
|                                               |                                              |             |                                            | L             | T | P  |         |
| Theory                                        |                                              |             |                                            |               |   |    |         |
| 1                                             | BS                                           | BS-CH101    | Chemistry                                  | 3             | 1 | 0  | 4       |
| 2                                             | BS                                           | BS-M101     | Mathematics-I                              | 3             | 1 | 0  | 4       |
| 3                                             | ES                                           | ES-CS101    | Programming for Problem Solving            | 3             | 0 | 0  | 3       |
|                                               | Total Theory                                 |             |                                            | 9             | 2 | 0  | 11      |
| Practical/ Sessional/ Mandatory Course        |                                              |             |                                            |               |   |    |         |
| 1                                             | BS                                           | BS-CH191    | Chemistry Laboratory                       | 0             | 0 | 3  | 1.5     |
| 2                                             | ES                                           | ES-CS191    | Programming for Problem Solving Laboratory | 0             | 0 | 4  | 2       |
| 3                                             | ES                                           | ES-ME192    | Workshop/Manufacturing Practices           | 1             | 0 | 4  | 3       |
| 4                                             | HM                                           | HM-HU191    | Language Laboratory                        | 0             | 0 | 2  | 1       |
|                                               | Total Practical/ Sessional/ Mandatory Course |             |                                            | 1             | 0 | 13 | 7.5     |
| Total of First Semester                       |                                              |             |                                            | 10            | 2 | 13 | 18.5    |

| Second Semester (First Year)                 |          |             |                                                         |               |   |    |         |
|----------------------------------------------|----------|-------------|---------------------------------------------------------|---------------|---|----|---------|
| Sl No.                                       | Category | Course Code | Course Name                                             | Contact Hours |   |    | Credits |
|                                              |          |             |                                                         | L             | T | P  |         |
| Theory                                       |          |             |                                                         |               |   |    |         |
| 1                                            | BS       | BS-PH201    | Physics                                                 | 3             | 1 | 0  | 4       |
| 2                                            | BS       | BS-M201     | Mathematics-II                                          | 3             | 1 | 0  | 4       |
| 3                                            | ES       | ES-EE201    | Basic Electrical and Electronics Engineering            | 4             | 0 | 0  | 4       |
| 4                                            | HM       | HM-HU201    | English                                                 | 2             | 0 | 0  | 2       |
| Total Theory                                 |          |             |                                                         | 12            | 2 | 0  | 14      |
| Practical/ Sessional/ Mandatory Course       |          |             |                                                         |               |   |    |         |
| 1                                            | BS       | BS-PH291    | Physics Laboratory                                      | 0             | 0 | 3  | 1.5     |
| 2                                            | ES       | ES-EE291    | Basic Electrical and Electronics Engineering Laboratory | 0             | 0 | 4  | 2       |
| 3                                            | ES       | ES-ME291    | Engineering Graphics & Design                           | 1             | 0 | 4  | 3       |
| Total Practical/ Sessional/ Mandatory Course |          |             |                                                         | 1             | 0 | 11 | 6.5     |
| Total of Second Semester                     |          |             |                                                         | 13            | 2 | 11 | 20.5    |

| Third Semester (Second Year)                  |          |             |                                       |               |   |   |         |
|-----------------------------------------------|----------|-------------|---------------------------------------|---------------|---|---|---------|
| Sl No.                                        | Category | Course Code | Course Name                           | Contact Hours |   |   | Credits |
|                                               |          |             |                                       | L             | T | P |         |
| Theory                                        |          |             |                                       |               |   |   |         |
| 1                                             | ES       | ES-EC(D)301 | Communication Engineering             | 2             | 0 | 0 | 2       |
| 2                                             | ES       | ES-EC302    | Digital Electronics                   | 3             | 0 | 0 | 3       |
| 3                                             | BS       | BS-M301     | Mathematics III                       | 3             | 0 | 0 | 3       |
| 4                                             | PC       | PC-CS301    | Data Structures and Algorithms        | 3             | 0 | 0 | 3       |
| 5                                             | HM       | HM-HU301    | Introduction to Industrial Management | 2             | 0 | 0 | 2       |
| 6                                             | BS       | BS-BIO301   | Biology                               | 2             | 0 | 0 | 2       |
| Total Theory                                  |          |             |                                       | 15            | 0 | 0 | 15      |
| Practical/ Sessional/ Mandatory Course        |          |             |                                       |               |   |   |         |
| 1                                             | ES       | ES-EC392    | Digital Electronics Lab               | 0             | 0 | 3 | 1.5     |
| 2                                             | PC       | PC-CS391    | Data Structures and Algorithm Lab     | 0             | 0 | 3 | 1.5     |
| 3                                             | PC       | PC-CS392    | IT Workshop (Using Python) Lab        | 0             | 0 | 3 | 1.5     |
| 4                                             | MC       | MC371       | Environmental Sciences                | 2             | 0 | 0 | 0       |
| Total Practical/ Sessional / Mandatory Course |          |             |                                       | 2             | 0 | 9 | 4.5     |
| Total of Third Semester                       |          |             |                                       | 17            | 0 | 9 | 19.5    |

| Fourth Semester (Second Year)                |          |             |                                            |               |   |    |         |
|----------------------------------------------|----------|-------------|--------------------------------------------|---------------|---|----|---------|
| Sl No.                                       | Category | Course Code | Course Name                                | Contact Hours |   |    | Credits |
|                                              |          |             |                                            | L             | T | P  |         |
| Theory                                       |          |             |                                            |               |   |    |         |
| 1                                            | BS       | BS-M404     | Numerical Methods                          | 2             | 0 | 0  | 2       |
| 2                                            | PC       | PC-CS(D)401 | Computer Organization and Architecture     | 3             | 0 | 0  | 3       |
| 3                                            | PC       | PC-CS402    | Operating System                           | 3             | 0 | 0  | 3       |
| 4                                            | PC       | PC-CS403    | Design and Analysis of Algorithm           | 3             | 0 | 0  | 3       |
| 5                                            | PC       | PC-CS404    | Discrete Mathematics                       | 3             | 0 | 0  | 3       |
| Total Theory                                 |          |             |                                            | 14            | 0 | 0  | 14      |
| Practical/ Sessional / Mandatory Course      |          |             |                                            |               |   |    |         |
| 1                                            | BS       | BS-M494     | Numerical Methods Lab                      | 0             | 0 | 2  | 1       |
| 2                                            | PC       | PC-CS(D)491 | Computer Organization and Architecture Lab | 0             | 0 | 3  | 1.5     |
| 3                                            | PC       | PC-CS492    | Operating System Lab                       | 0             | 0 | 3  | 1.5     |
| 4                                            | PC       | PC-CS493    | Design and Analysis of Algorithm Lab       | 0             | 0 | 3  | 1.5     |
| 5                                            | MC       | MC472       | Constitution of India                      | 2             | 0 | 0  | 0       |
| Total Practical/ Sessional/ Mandatory Course |          |             |                                            | 2             | 0 | 11 | 5.5     |
| Total of Fourth Semester                     |          |             |                                            | 16            | 0 | 11 | 19.5    |

| Fifth Semester (Third Year)                   |          |             |                                     |               |   |    |         |
|-----------------------------------------------|----------|-------------|-------------------------------------|---------------|---|----|---------|
| Sl No.                                        | Category | Course Code | Course Name                         | Contact Hours |   |    | Credits |
|                                               |          |             |                                     | L             | T | P  |         |
| Theory                                        |          |             |                                     |               |   |    |         |
| 1                                             | PC       | PC-CS(D)501 | Machine Learning                    | 3             | 0 | 0  | 3       |
| 2                                             | PC       | PC-CS502    | Object Oriented Programming         | 3             | 0 | 0  | 3       |
| 3                                             | PC       | PC-CS503    | Formal Language and Automata Theory | 3             | 0 | 0  | 3       |
| 4                                             | PC       | PC-CS(D)504 | Introduction to Data Science        | 2             | 0 | 0  | 2       |
| 5                                             | PE       | PE-CS(D)501 | Professional Elective-I             | 3             | 0 | 0  | 3       |
| 6                                             | HM       | HM-HU501    | Economics for Engineers             | 2             | 0 | 0  | 2       |
| Total Theory                                  |          |             |                                     | 16            | 0 | 0  | 16      |
| Practical/ Sessional/ Mandatory Courses       |          |             |                                     |               |   |    |         |
| 1                                             | PC       | PC-CS(D)591 | Machine Learning Lab                | 0             | 0 | 3  | 1.5     |
| 2                                             | PC       | PC-CS592    | Object Oriented Programming Lab     | 0             | 0 | 3  | 1.5     |
| 3                                             | PC       | PC-CS(D)593 | Introduction to R Programming       | 0             | 0 | 2  | 1       |
| 4                                             | HM       | HM-HU591    | Soft Skills Development Lab         | 0             | 0 | 2  | 1       |
| 5                                             | MC       | MC571       | Aptitude Skill Development-I        | 2             | 0 | 0  | 0       |
| Total Practical/ Sessional/ Mandatory Courses |          |             |                                     | 2             | 0 | 10 | 5       |
| Total of Fifth Semester                       |          |             |                                     | 18            | 0 | 10 | 21      |

|                    |                                |
|--------------------|--------------------------------|
| <b>PE-CS(D)501</b> | <b>Professional Elective-I</b> |
| PE-CS(D)501A       | Software Engineering           |
| PE-CS(D)501B       | Advanced Algorithm             |
| PE-CS(D)501C       | Computer Graphics              |

| Sixth Semester (Third Year)                   |          |             |                                |               |   |    |         |
|-----------------------------------------------|----------|-------------|--------------------------------|---------------|---|----|---------|
| Sl No.                                        | Category | Course Code | Course Name                    | Contact Hours |   |    | Credits |
|                                               |          |             |                                | L             | T | P  |         |
| Theory                                        |          |             |                                |               |   |    |         |
| 1                                             | PC       | PC-CS601    | Compiler Design                | 3             | 0 | 0  | 3       |
| 2                                             | PC       | PC-CS602    | Data Base Management System    | 3             | 0 | 0  | 3       |
| 3                                             | PC       | PC-CS603    | Computer Networks              | 3             | 0 | 0  | 3       |
| 4                                             | PC       | PC-CS604    | High Performance Computing     | 3             | 0 | 0  | 3       |
| 5                                             | PE       | PE-CS(D)601 | Professional Elective-II       | 3             | 0 | 0  | 3       |
| 6                                             | PE       | PE-CS(D)602 | Professional Elective-III      | 3             | 0 | 0  | 3       |
| Total Theory                                  |          |             |                                | 18            | 0 | 0  | 18      |
| Practical/ Sessional/ Mandatory Courses       |          |             |                                |               |   |    |         |
| 1                                             | PC       | PC-CS692    | Database Management System Lab | 0             | 0 | 3  | 1.5     |
| 2                                             | PC       | PC-CS693    | Computer Networks Lab          | 0             | 0 | 3  | 1.5     |
| 3                                             | PW       | PW-CS681    | Project-I                      | 0             | 0 | 6  | 3       |
| 4                                             | MC       | MC671       | Aptitude Skill Development-II  | 2             | 0 | 0  | 0       |
| Total Practical/ Sessional/ Mandatory Courses |          |             |                                | 2             | 0 | 12 | 6       |
| Total of Sixth Semester                       |          |             |                                | 20            | 0 | 12 | 24      |

| List of Elective Courses |                                   |
|--------------------------|-----------------------------------|
| <b>PE-CS(D)601</b>       | <b>Professional Elective-II</b>   |
| PE-CS(D)601A             | Data Mining                       |
| PE-CS(D)601B             | Ad-Hoc & Wireless Sensor Networks |
| PE-CS(D)601C             | Image Processing                  |
| <b>PE-CS(D)602</b>       | <b>Professional Elective-III</b>  |
| PE-CS(D)602A             | Distributed Computing             |
| PE-CS(D)602B             | Soft Computing                    |
| PE-CS(D)602C             | Data analysis and Visualization   |

| Seventh Semester (Fourth Year) |          |             |                                         |               |   |    |         |
|--------------------------------|----------|-------------|-----------------------------------------|---------------|---|----|---------|
| Sl No.                         | Category | Course Code | Course Name                             | Contact Hours |   |    | Credits |
|                                |          |             |                                         | L             | T | P  |         |
| Theory                         |          |             |                                         |               |   |    |         |
| 1                              | PE       | PE-CS(D)701 | Professional Elective-IV                | 3             | 0 | 0  | 3       |
| 2                              | PE       | PE-CS(D)702 | Professional Elective-V                 | 3             | 0 | 0  | 3       |
| 3                              | OE       | OE-CS(D)701 | Open Elective-I                         | 3             | 0 | 0  | 3       |
| 4                              | OE       | OE-CS(D)702 | Open Elective-II                        | 3             | 0 | 0  | 3       |
| 5                              | HM       | HM-HU702    | Project Management and Entrepreneurship | 3             | 0 | 0  | 3       |
| Total Theory                   |          |             |                                         | 15            | 0 | 0  | 15      |
| Practical/ Sessional           |          |             |                                         |               |   |    |         |
| 1                              | PW       | PW-CS781    | Project-II                              | 0             | 0 | 8  | 4       |
| 2                              | PW       | PW-CS782    | Summer Internship                       | 0             | 0 | 4  | 2       |
| Total Practical/ Sessional     |          |             |                                         | 0             | 0 | 12 | 6       |
| Total of Seventh Semester      |          |             |                                         | 15            | 0 | 12 | 21      |

| List of Elective Courses |                                        |
|--------------------------|----------------------------------------|
| <b>PE-CS(D)701</b>       | <b>Professional Elective-IV</b>        |
| PE-CS(D)701A             | Data Security and Authentication       |
| PE-CS(D)701B             | Cloud Computing                        |
| PE-CS(D)701C             | Neural Networks and Deep Learning      |
| <b>PE-CS(D)702</b>       | <b>Professional Elective-V</b>         |
| PE-CS(D)702A             | Internet of Things                     |
| PE-CS(D)702B             | Pattern Recognition                    |
| PE-CS(D)702C             | Optimization Technique                 |
| <b>OE-CS(D)701</b>       | <b>Open Elective-I</b>                 |
| OE-CS(D)701A             | Time Series Analysis and Forecasting   |
| OE-CS(D)701B             | Operational Research                   |
| OE-CS(D)701C             | Block Chain Technology                 |
| <b>OE-CS(D)702</b>       | <b>Open Elective-II</b>                |
| OE-CS(D)702A             | Cyber Law and Security Policy          |
| OE-CS(D)702B             | E-Commerce                             |
| OE-CS(D)702C             | Introduction to Philosophical Thoughts |

| Eighth Semester (Fourth Year) |          |             |                          |               |   |    |         |
|-------------------------------|----------|-------------|--------------------------|---------------|---|----|---------|
| Sl No.                        | Category | Course Code | Course Name              | Contact Hours |   |    | Credits |
|                               |          |             |                          | L             | T | P  |         |
| Theory                        |          |             |                          |               |   |    |         |
| 1                             | PE       | PE-CS(D)801 | Professional Elective-VI | 3             | 0 | 0  | 3       |
| 2                             | OE       | OE-CS(D)801 | Open Elective-III        | 3             | 0 | 0  | 3       |
| 3                             | OE       | OE-CS(D)802 | Open Elective-IV         | 3             | 0 | 0  | 3       |
| Total Theory                  |          |             |                          | 9             | 0 | 0  | 9       |
| Practical/ Sessional          |          |             |                          |               |   |    |         |
| 1                             | PW       | PW-CS881    | Project-II               | 0             | 0 | 12 | 6       |
| Total Practical/ Sessional    |          |             |                          | 0             | 0 | 12 | 6       |
| Total of Eighth Semester      |          |             |                          | 9             | 0 | 12 | 15      |

| List of Elective Courses |                                                        |
|--------------------------|--------------------------------------------------------|
| <b>PE-CS(D)801</b>       | <b>Professional Elective-VI</b>                        |
| PE-CS(D)801A             | Big Data Analysis                                      |
| PE-CS(D)801B             | Cryptography and Network Security                      |
| PE-CS(D)801C             | Web and Internet Technology                            |
| <b>OE-CS(D)801</b>       | <b>Open Elective-III</b>                               |
| OE-CS(D)801A             | Game Theory                                            |
| OE-CS(D)801B             | Business Intelligence                                  |
| OE-CS(D)801C             | Speech and Natural Language Processing                 |
| <b>OE-CS(D)802</b>       | <b>Open Elective-IV</b>                                |
| OE-CS(D)802A             | Human Resource Development and Organizational Behavior |
| OE-CS(D)802B             | Social Media and Web Analytics                         |
| OE-CS(D)802C             | Business Analytics and Entrepreneurship                |