**BS(SE) Program Road Map Batch 20 (F2021)**

**Total courses: 44 Total Credit Hours:132**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **1st Semester** | | | | **2nd Semester** | | | |
| **Course Code** | **Course Title** | **Cr. Hrs.** | **Pre-req** | **Course Code** | **Course Title** | **Cr. Hrs.** | **Pre-req** |
| IT1091 | Introduction to Info & Comm. Technologies | 2 |  | CC1022 | Object Oriented Programming | 3 | CC1021, CC1021L |
| IT1091L | Introduction to Info & Comm. Technologies Lab | 1 |  | CC1022L | Object Oriented Programming Lab | 1 | CC1021, CC1021L |
| CC1021 | Programming Fundamentals | 3 |  | CC1041 | Discrete Structures | 3 |  |
| CC1021L | Programming Fundamentals Lab | 1 |  | EN125 | Composition & Communication | 3 | EN111 |
| MA107 | Calculus and Analytical Geometry | 3 |  | NS125 | Applied Physics | 2 |  |
| EN111 | English Grammar & Comprehension | 3 |  | NS125L | Applied Physics Lab | 1 |  |
| ISL101 | Islamic Studies | 3 |  | POL101 | Pakistan Studies | 3 |  |
|  | **Semester Credit Hours** | **16** |  |  | **Semester Credit Hours** | **16** |  |

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| **3rd Semester** | | | | | **4th Semester** | | | |
| **Course Code** | **Course Title** | **Cr. Hrs.** | | **Pre-req** | **Course Code** | **Course Title** | **Cr. Hrs.** | **Pre-req** |
| CC2042 | Data Structures and Algorithms | 3 | | CC1022, CC1022L | CC2141 | Database Systems | 3 | CC2042, CC2042L |
| CC2042L | Data Structures and Algorithms Lab | 1 | | CC1022, CC1022L | CC2141L | Database Systems Lab | 1 | CC2042, CC2042L |
| MA210 | Linear Algebra | 3 | |  | MA150 | Probability and Statistics | 3 |  |
| CC2101 | Software Engineering | 3 | |  | SE2102 | Software Requirement Engineering (SRE) | 3 | CC2101 |
| EN220 | Research Paper Writing & Presentation | 3 | | EN125 |  | Supporting Elective I | 3 |  |
|  | GE/University Elective-I | 3 | |  |  | GE/University Elective II | 3 |  |
|  | **Semester Credit Hours** | **16** | |  |  | **Semester Credit Hours** | **16** |  |
|  |  |  | |  |  |  |  |  |
| **5th Semester** | | | | | **6th Semester** | | | |
| **Course Code** | **Course Title** | | **Cr. Hrs.** | **Pre-req** | **Course Code** | **Course Title** | **Cr. Hrs.** | **Pre-req** |
| SE3103 | Software Design and Architecture | | 2 | SE2102 | SE3111 | Software Construction and Development | 2 | SE3103 |
| SE3103L | Software Design and Architecture Lab | | 1 | SE2102 | SE3111L | Software Construction and Development Lab | 1 | SE3103 |
| CC3011 | Operating Systems | | 3 | CC2042,  CC2042L | SE3162 | Web Engineering | 3 |  |
| CC3011L | Operating Systems Lab | | 1 | CC2042, CC2042L | SE4114 | Human Computer Interaction | 3 | CC2101 |
| CC3071 | Computer Networks | | 3 |  | CC3121 | Information Security | 3 |  |
| CC3071L | Computer Networks Lab | | 1 |  | SD102 | 21st Century Skills | 0 |  |
| SD100 | English Immersion | | 0 |  |  | Supporting Elective II | 3 |  |
|  | GE/University Elective III | | 3 |  |  | Technical Elective II | 3 |  |
|  | Technical Elective I | | 3 |  |  |  |  |  |
|  | **Semester Credit Hours** | | **17** |  |  | **Semester Credit Hours** | **18** |  |

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| **7th Semester** | | | | **8th Semester** | | | |
| **Course Code** | **Course Title** | **Cr. Hrs.** | **Pre-req** | **Course Code** | **Course Title** | **Cr. Hrs.** | **Pre-req** |
| CC4181 | Final Year Project-I | 3 |  | CC4182 | Final Year Project-II | 3 | CC4181 |
| SE4192 | Software Project Management | 3 | CC2101 | HU4092 | Professional Practices | 3 |  |
| SE4112 | Software Quality Engineering | 3 | CC2101 |  | Supporting Elective III | 3 |  |
| SE4113 | Software Re-Engineering | 3 | SE3111, SE3111L |  | GE/University Elective IV | 3 |  |
|  | Technical Elective III | 3 |  |  | Technical Elective V | 3 |  |
|  | Technical Elective IV | 3 |  |  |  |  |  |
|  | **Semester Credit Hours** | **18** |  |  | **Semester Credit Hours** | **15** |  |

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**Dr. Malik Tahir Hassan Dr. Yaser Daanial Khan**

**Chairperson Dean**

**Department of Software Engineering School of Systems and Technology**

# Program Structure

**1. Computing Core (11 Courses, 39 credit hours)**

1. Programming Fundamentals
2. Object Oriented Programming
3. Data Structures & Algorithms
4. Discrete Structures
5. Operating Systems
6. Database Systems
7. Software Engineering
8. Computer Networks
9. Information Security
10. Final Year Project I
11. Final Year Project II

**2. Program Core (8 courses, 24 credit hours)**

1. Human Computer Interaction
2. Software Construction & Development
3. Software Design & Architecture
4. Software Project Management
5. Software Quality Engineering
6. Software Re-Engineering
7. Software Requirements Engineering
8. Web Engineering

**3. Mathematics and Science Foundation Courses (4 courses, 12**

**credit hours)**

1. Applied Physics
2. Calculus & Analytical Geometry
3. Linear Algebra
4. Probability & Statistics

**4. General Education courses (7 courses, 21 credit hours)**

1. English Composition & Comprehension
2. Technical & Business Writing\Research Paper writing and presentation skills
3. Communication & Presentation Skills
4. Professional Practices
5. Intro to Info. & Comm. Technologies
6. Pakistan Studies
7. Islamic Studies/ Ethics
8. English Immersion 1
9. 21st Century Skills

**5. Supporting Electives Annexure I**

3 Courses, 9 credit hours

**6. University Electives Annexure II**

4 Courses, 12 credit hours

**7. Program Electives (Technical Electives) Annexure III**

5 Courses,15 credit hours

**Annexure I**

**Supporting Electives (Any three, 9 Credit Hours)**

* Business Process Engineering
* Operation Research
* Formal Methods in Software Engineering
* Simulation and Modeling
* Stochastic Processes

**Annexure II**

**University Electives (non-exhaustive list)**

**Any four (12 Credit Hours)**

* Introduction to Psychology
* Foreign Language
* Business Ethics
* Principles of Marketing
* Introduction to Sociology
* Life & Learning
* Economics
* Organizational Behavior
* IT Entrepreneurship
* Principles of Management

**Annexure III**

**Program Electives (Technical Electives)**

**Note:** The list is by no means exhaustive. Department can add new courses.

**Any five courses (15 Credit Hours)**

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| **Sr. No.** | **Course Code** | **Course Title** | **Cr. Hrs.** |
|  | IT4076 | Advanced Networks | 3 |
|  | IT4163 | Advanced Web Technologies | 3 |
|  | CS4131 | Big Data Programming | 3 |
|  | IT4021 | Bioinformatics | 3 |
|  | IT4146 | Blockchain Technology and Application | 3 |
|  | CS4173 | Cloud Computing | 3 |
|  | IT4222 | Cognitive Radio Communication and Networks | 3 |
|  | CS4023 | Competitive Programming | 3 |
|  | SE4116 | Component Based Software Engineering | 3 |
|  | CS4211 | Computer Animations | 3 |
|  | CS4012 | Computer Graphics | 3 |
|  | CS4013 | Computer Vision | 3 |
|  | CS4123 | Cyber Forensics | 3 |
|  | IT4073 | Data Communications | 3 |
|  | SE4132 | Data Mining | 3 |
|  | CS4134 | Data Science & Big Data Analytics | 3 |
|  | CS4135 | Data Science Technologies | 3 |
|  | IT4143 | Data Warehousing | 3 |
|  | IT4144 | Database Administration | 3 |
|  | CS4152 | Deep Learning and Neural Networks | 3 |
|  | SE4115 | Design Pattern and Refactoring | 3 |
|  | CS4014 | Digital Image Processing | 3 |
|  | CS4145 | Distributed Database Systems | 3 |
|  | IT4174 | Distributed Systems | 3 |
|  | CS4033 | Embedded Systems | 3 |
|  | SE4164 | Enterprise Application Development | 3 |
|  | IT4232 | Enterprise Architecture | 3 |
|  | CS4153 | Expert Systems and Knowledge Management | 3 |
|  | IT4221 | Free Space Optics | 3 |
|  | SE4165 | Games Design and Development | 3 |
|  | CS4133 | Information Retrieval | 3 |
|  | IT4015 | Information Systems | 3 |
|  | CS4176 | Internet of Things | 3 |
|  | SE4166 | iPhone Applications Development | 3 |
|  | CS4154 | Machine Learning | 3 |
|  | SE4167 | Mobile Application Development | 3 |
|  | CS4155 | Multi-Agent Systems | 3 |
|  | CS4124 | Multimedia Security | 3 |
|  | CS4156 | Natural Language Processing | 3 |
|  | IT4074 | Network Flows | 3 |
|  | IT4223 | Next Generation Networks | 3 |
|  | CS4175 | Pervasive Smart Environments | 3 |
|  | SE4125 | Secure Software Development | 3 |
|  | IT4233 | System Integration and Architecture | 3 |
|  | CS3044 | Analysis of Algorithms | 3 |