Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

*(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)*

**(Accredited 'A' Grade by NAAC with a score of 3.25)**

Hingna Road, Wanadongri, Nagpur - 441 110


# Bachelor of Technology

# SoE & Syllabus 2021

# 3rd to 8th Semester

**(Department of Computer Science & Engineering**

**Computer Sciences & Engineering**

28 June 2019

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. CSE-202.1

## B.TECH SCHEME OF EXAMINATION 2020-21

(Scheme of Examination w.e.f. 2022-23 onward)

## Computer Science & Engineering

| SN | Sem | Type | Course Code | Course Name | T/P | Contact Hours | | | | Credits | % Weightage | | | ESE Duration Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | T | P | Hrs | | MSEs* | TA** | ESE | |
| TOTAL FIRST & SECOND SEM | | | | | | | | | | 47 | | | | |
| **Third Semester** | | | | | | | | | | | | | | |
| 1 | 3 | BS | GE2201 | Engineering Mathematics III | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 3 | PC | CSE2201 | Computer Architecture and Organisation | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 3 | 3 | PC | CSE2202 | Object Oriented Programming | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 4 | 3 | PC | CSE2203 | Lab: Object Oriented Programming | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 5 | 3 | PC | CSE2204 | Data Structures I | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 6 | 3 | PC | CSE2205 | Lab: Data Structures I | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 7 | 3 | PC | CSE2206 | Lab: Software Laboratory | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| TOTAL | | | | | | 12 | 0 | 6 | 18 | 15 | | | | |
| **Fourth Semster** | | | | | | | | | | | | | | |
| 1 | 4 | BS | GE2207 | Discrete Mathematics & Graph Therory | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 4 | PC | CSE2251 | Operating Systems | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 3 | 4 | PC | CSE2252 | Lab:Operating Systems | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 4 | 4 | PC | CSE2253 | Data Structures II | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 5 | 4 | PC | CSE2254 | Lab: Data Structures II | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 6 | 4 | PC | CSE2255 | Introduction to Data Analysis | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 7 | 4 | PC | CSE2256 | Lab: Introduction to Data Analysis | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 8 | 4 | PC | CSE2257 | Theory of Computation | T | 4 | 0 | 0 | 4 | 4 | 30 | 20 | 50 | 3 Hours |
| TOTAL | | | | | | 16 | 0 | 6 | 22 | 19 | | | | |
| **Audit Courses** | | | | | | | | | | | | | | |
| 1 | 4 | HS | GE2121 | Env Studies for 4 Sem. CV,ME,EE,IT, CSE | T | 2 | 0 | 0 | | | | | | |
| 2 | 3 | HS | AU2123 | YCCE Communication Aptitude Preparation (YCAP3) | A | 3 | 0 | 0 | 3 | 0 | | | | |
| 3 | 4 | HS | AU2124 | YCCE Communication Aptitude Preparation (YCAP4.1) for CV,ME,CT,IT,CSE | A | 3 | 0 | 0 | 3 | 0 | | | | |

**MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment**

**TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance**

**TA** = for Practical : MSPA will be 15 marks each**

| | | | |
|---|---|---|---|
| | | June 2022 | 1.01 |
| Chairperson | Dean (Acad. Matters) | Date of Release | Version |

**Applicable for AY 2022-23 Onwards**

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. CSE-202.1

## B.TECH SCHEME OF EXAMINATION 2020-21

(Scheme of Examination w.e.f. 2022-23 onward)

## Computer Science & Engineering

| SN | Sem | Type | Course Code | Course Name | T/P | Contact Hours | | | | Credits | % Weightage | | | ESE Duration Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | T | P | Hrs | | MSEs* | TA** | ESE | |
| **Fifth Semester** | | | | | | | | | | | | | | |
| 1 | 5 | HS | GE2312 | Fundamentals of Economics | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 5 | PC | CSE2301 | Database Management Systems | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 3 | 5 | PC | CSE2302 | Lab: Database Management Systems | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 4 | 5 | PC | CSE2303 | Design & Analysis of Algorithms | **T** | 4 | 0 | 0 | 4 | 4 | 30 | 20 | 50 | 3 Hours |
| 5 | 5 | PC | CSE2304 | Lab: Design & Analysis of Algorithms | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 6 | 5 | PE | | Professional Elective-I | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 7 | 5 | PE | | Lab: Professional Elective-I | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 8 | 5 | OE | | Open Elective - I * | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 9 | 5 | OE | | Open Elective - II * | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 10 | **5/6** | **STR** | **CSE2310** | **Seminar** | **P** | **0** | **0** | **0** | **0** | **1** | | 100 | | |
| | | | | | **TOTAL** | **19** | **0** | **6** | **25** | **23** | | | | |

**Professional Electives -I**

| | | | | |
|---|---|---|---|---|
| 1 | 5 | PE-I | CSE2311 | PE I: Business Intelligence |
| | 5 | PE-I | CSE2312 | PE I: Lab: Business Intelligence |
| 2 | ~~5~~ | PE-I | CSE2313 | PE I: Web Technologies |
| | 5 | PE-I | CSE2314 | PE I: Lab: Web Technologies |
| 3 | 5 | PE-I | CSE2315 | PE I: Introduction to Geographical Information System |
| | 5 | PE-I | CSE2316 | PE I: Lab: Introduction to Geographical Information System |
| 4 | 5 | PE-I | CSE2317 | PE I: Mobile Operating System |
| | 5 | PE-I | CSE2318 | PE I: Lab: Mobile Operating System |

**Open Electives -I**

| | | | | |
|---|---|---|---|---|
| 1 | 5 | OE-I | CSE2331 | OE I: Database System Essentials |
| 2 | 5 | OE-I | CSE2332 | OE I: Introduction to Image Processing |
| 3 | 5 | OE-I | CSE2333 | OE I: Programming with Python |

**Open Electives -II**

| | | | | |
|---|---|---|---|---|
| 1 | 5 | OE-II | CSE2341 | OE II: Software Testing for Beginners |
| 2 | 5 | OE-II | CSE2342 | OE II: Introduction to Web Technology |
| 3 | 5 | OE-II | CSE2343 | OE II: Introduction to Cloud Computing |

| **Audit Courses** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5 | HS | AU2126 | YCCE Communication Aptitude Preparation (YCAP5.1) for CV,ME,CT,IT,CSE, IIoT, AIDS, CSD, AIML | **A** | 3 | 0 | 0 | 3 | 0 | |

**MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment**

**TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance**

**TA** = for Practical : MSPA will be 15 marks each**

| | | | |
|---|---|---|---|
| | | June 2022 | 1.01 |
| **Chairperson** | **Dean (Acad. Matters)** | **Date of Release** | **Version** |

**Applicable for AY 2022-23 Onwards**

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. CSE-202.1

## B.TECH SCHEME OF EXAMINATION 2020-21

(Scheme of Examination w.e.f. 2022-23 onward)

## Computer Science & Engineering

| SN | Sem | Type | Course Code | Course Name | T/P | Contact Hours | | | | Credits | % Weightage | | | ESE Duration Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | T | P | Hrs | | MSEs* | TA** | ESE | |
| **Sixth Semester** | | | | | | | | | | | | | | |
| 1 | 6 | HS | GE2311 | Fundamentals of Management | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 6 | PC | CSE2351 | Computer Networks | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 3 | 6 | PC | CSE2352 | Lab: Computer Networks | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 4 | 6 | PC | CSE2353 | Compilers | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 5 | 6 | PC | CSE2354 | Lab: Compilers | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 6 | 6 | PC | CSE2355 | Software Engineering | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 7 | 6 | PC | CSE2356 | Lab: Software Engineering | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 8 | 6 | PE | | Professional Elective-II | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 9 | 6 | PE | | Lab: Professional Elective-II | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 10 | 6 | OE | | Open Elective - III ** | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 11 | 6 | OE | | Open Elective - IV ** | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| | | | | **TOTAL** | | **21** | **0** | **8** | **29** | **25** | | | | |

**Professional Electives -II**

| | | | | |
|---|---|---|---|---|
| 1 | 6 | PE-II | CSE2361 | PE II: Digital Image Processing |
| | 6 | PE-II | CSE2362 | PE II: Lab:Digital Image Processing |
| 2 | 6 | PE-II | CSE2363 | PE II: Internet of Things |
| | 6 | PE-II | CSE2364 | PE II: Lab: Internet of Things |
| 3 | 6 | PE-II | CSE2365 | PE II: Neural Network and applications |
| | 6 | PE-II | CSE2366 | PE II: Lab Neural Network and applications |

**Open Electives -III**

| | | | | |
|---|---|---|---|---|
| 1 | 6 | OE-III | CSE2371 | OE III: Database System Essentials |
| 2 | 6 | OE-III | CSE2372 | OE III: Introduction to Image Processing |
| 3 | 6 | OE-III | CSE2373 | OE III: Programming with Python |

**Open Electives -IV**

| | | | | |
|---|---|---|---|---|
| 1 | 6 | OE-IV | CSE2381 | OE IV: Software Testing for Beginners |
| 2 | 6 | OE-IV | CSE2382 | OE IV: Introduction to Cloud Computing |
| 3 | 6 | OE-IV | CSE2383 | OE IV: Introduction to Web Technology |

| **Audit Courses** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6 | HS | AU2130 | YCCE Communication Aptitude Preparation (YCAP6.3) for CT, IT, CSE | **A** | 3 | 0 | 0 | 3 | 0 | |

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**TA** = for Practical : MSPA will be 15 marks each**

| | | | |
|---|---|---|---|
| | | June 2022 | 1.01 |
| **Chairperson** | **Dean (Acad. Matters)** | **Date of Release** | **Version** |

**Applicable for AY 2022-23 Onwards**

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**(Accredited 'A' Grade by NAAC with a score of 3.25)**

Hingna Road, Wanadongri, Nagpur - 441 110

# Bachelor of Technology

# SoE & Syllabus 2021

# 3rd Semester

**(Department of Computer Science & Engineering**

## Computer Sciences & Engineering

After 26# A.C.

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. CSE-202.1

## B.TECH SCHEME OF EXAMINATION 2020-21

(Scheme of Examination w.e.f. 2022-23 onward)

## Computer Science & Engineering

| SN | Sem | Type | Course Code | Course Name | T/P | Contact Hours | | | | Credits | % Weightage | | | ESE Duration Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | T | P | Hrs | | MSEs* | TA** | ESE | |
| TOTAL FIRST & SECOND SEM | | | | | | | | | | 47 | | | | |
| **Third Semester** | | | | | | | | | | | | | | |
| 1 | 3 | BS | GE2201 | Engineering Mathematics III | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 3 | PC | CSE2201 | Computer Architecture and Organisation | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 3 | 3 | PC | CSE2202 | Object Oriented Programming | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 4 | 3 | PC | CSE2203 | Lab: Object Oriented Programming | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 5 | 3 | PC | CSE2204 | Data Structures I | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 6 | 3 | PC | CSE2205 | Lab: Data Structures I | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 7 | 3 | PC | CSE2206 | Lab: Software Laboratory | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| TOTAL | | | | | | 12 | 0 | 6 | 18 | 15 | | | | |
| **Fourth Semster** | | | | | | | | | | | | | | |
| 1 | 4 | BS | GE2207 | Discrete Mathematics & Graph Therory | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 4 | PC | CSE2251 | Operating Systems | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 3 | 4 | PC | CSE2252 | Lab:Operating Systems | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 4 | 4 | PC | CSE2253 | Data Structures II | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 5 | 4 | PC | CSE2254 | Lab: Data Structures II | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 6 | 4 | PC | CSE2255 | Introduction to Data Analysis | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 7 | 4 | PC | CSE2256 | Lab: Introduction to Data Analysis | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 8 | 4 | PC | CSE2257 | Theory of Computation | T | 4 | 0 | 0 | 4 | 4 | 30 | 20 | 50 | 3 Hours |
| TOTAL | | | | | | 16 | 0 | 6 | 22 | 19 | | | | |
| **Audit Courses** | | | | | | | | | | | | | | |
| 1 | 4 | HS | GE2121 | Env Studies for 4 Sem. CV,ME,EE,IT, CSE | T | 2 | 0 | 0 | | | | | | |
| 2 | 3 | HS | AU2123 | YCCE Communication Aptitude Preparation (YCAP3) | A | 3 | 0 | 0 | 3 | 0 | | | | |
| 3 | 4 | HS | AU2124 | YCCE Communication Aptitude Preparation (YCAP4.1) for CV,ME,CT,IT,CSE | A | 3 | 0 | 0 | 3 | 0 | | | | |

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**TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance**

**TA** = for Practical : MSPA will be 15 marks each**

| | | | |
|---|---|---|---|
| | | June 2022 | 1.01 |
| Chairperson | Dean (Acad. Matters) | Date of Release | Version |

**Applicable for AY 2022-23 Onwards**

## III Semester

## GE2201 - Engineering Mathematics III

| Objectives | Outcomes |
|---|---|
| 1. Able to find numerical solution of various mathematical equations<br>2. Give knowledge of Laplace transform, Fourier transform<br>3. Define the periodic functions in the form of Fourier series<br>4. Solve partial differential equations | The student will be able to:<br>1. Estimate the Calculus of Numerical Function.<br>2. Determine transforms and inverse transforms of various functions of variables and use it to solve Mathematical equations.<br>3. Discuss the nature of periodic function and express it in terms of series.<br>4. Use appropriate method/s to solve partial differential equations. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Unit I: Finite Differences**<br>**Difference** table; Operators E and Δ, Central differences, Factorials notation, Numerical differentiation and integration, Difference equations with constant coefficients. | 6 |
| 2 | **Unit II: Laplace Transform**<br>**Laplace Transforms:** Laplace transforms and their simple properties, Unit step function, inverse of Laplace transform, convolution theorem, Applications of Laplace transform to solve ordinary differential equations | 7 |
| 3 | **Unit III: Z-transform**<br>Z-Transform definition and properties (with proof), inversion by partial fraction decomposition and residue theorem, Applications of Z-transform to solve difference equations with constant coefficient. | 6 |
| 4 | **Unit IV: Fourier Series**<br>Periodic Functions and their Fourier series expansion, Fourier Series for even and odd function, Change of interval, half range expansions | 7 |
| 5 | **Unit V: Partial Differential Equation**<br>Partial Differential Equations of first order first degree i.e. Lagrange's form, linear homogeneous equations of higher order with constant coefficients. Application of variable separable method to solve first and second order partial differential equations. | 7 |
| 6 | **Unit VI : Fourier Transform :**<br>Definition: Fourier Integral Theorem, Fourier sine and cosine integrals, Finite Fourier sine & cosine Transform Parseval's Identity, convolution Theorem. | 6 |

**Text Books:**

| SNo | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Advance Engineering Mathematics | 9th Edition (September 2009) | Kreyszig. | Wiley |
| 2 | Higher Engineering Mathematics | 40th edition, (2010) | B.S. Grewal | Khanna Publishers (2006) |
| 3 | Advanced Engineering Mathematics | 8th revised edition,2007 | H.K. Dass | Publisher: S.Chand and Company Limited |

**Reference Books:**

| SNo | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Mathematics for Engineers | 19th edition, (2007) | Chandrika Prasad. | John Wiley & Sons |
| 2 | Advanced Mathematics for Engineers | 4th edition, (2006) | Chandrika Prasad | John Wiley & Sons |
| 3 | Applied Mathematics for Engineers | 3rd edition, (1970) | L.A. Pipes and Harville | McGraw Hill |
| 4 | A text Book of Applied Mathematics | 3rd edition, (2000) | P.N. and J.N. Wartikar | Pune Vidyarthi Griha Prakashan |
| 5 | A text book of Engineering Mathematics | Reprint 2008 | N.P. Bali and Manish Goyal | Laxmi Prakashan |

## III Semester
## CSE2201 : Computer Architecture and Organisation

| Objective | Course Outcome |
|---|---|
| 1. Understand basics of computer architecture, its components with peripheral devices, instruction set architecture<br>2. To introduce essentials of assembly language programming.<br>3. To introduce the students to inner working of CPU and its design based on hardwired and microprogrammed control unit<br>4. To deliver the knowledge of information representation within computers memory, and to know the hardware implementations of arithmetic operations on integers and floating point numbers<br>5. To study the function of each element of a memory hierarchy in view of its effects on overall system performance.<br>6. Learn the concepts of interrupts, I/o modules, DMA, and pipelining | On completion of the course, student will be able to<br>1. understand and demonstrate the basic computer architecture concepts related to the working of processors, memory systems, and input output systems.<br>2. differentiate among various addressing modes and develop ability to write assembly language programs.<br>3. comprehend information representation in computer and perform arithmetic operations using algorithms suitable for hardware implementation.<br>4. explain and compare techniques for improving the performance of a computer system components like CPU, main memory, input/output system and pipelining. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | Basic Structure of Computer Hardware and Software: Functional Units, Basic Operational Concepts, Bus Structures, Software, processor clock and basic performance evaluation, number systems, and arithmetic operations, Memory Locations, addressing and encoding of information, instruction and instruction sequencing, branching, condition codes, zero, one and two address instructions, RISC vs CISC computers. | 6 |
| 2 | Addressing modes, Stacks, and Subroutines, Processing Unit, Some fundamental concepts, Execution of a complete instruction, One, two, and three bus organization, Sequencing of control Signals, Assembly language programming. | 6 |
| 3 | Processor Design, hardwired control, Microprogrammed Control: Microinstructions, Grouping of control signals, Microprogram sequencing, Micro Instructions with next Address field, prefetching microinstructions. | 7 |
| 4 | Arithmetic (Fixed and Floating point): Number Representation, Addition of Positive numbers, Logic Design for fast adders, Addition and Subtraction, Arithmetic and Branching conditions, Multiplications of positive numbers, | 7 |

| | | |
|---|---|---|
| | Signed- Operand multiplication, Booth's Algorithm , fast Multiplication, Integer Division algorithms, Floating point numbers and operations, IEEE floating point standards | |
| 5 | The Main Memory: Basic concepts, Memory Hierarchy, semiconductor RAM memories, Static RAM vs Dynamic RAM, semiconductor ROM memories, DDRAM, Memory system considerations, Speed , Size and Cost. Cache Memory: cache memory mapping techniques, secondary storage devices, HDD vs SSD, Performance Considerations. | 6 |
| 6 | Computer Peripherals, I/O modules and I/O Devices, I/O transfers : program controlled, memory mapped and I/o mapped I/O, Interrupt handling and Interrupt driven I/O, DMA.<br><br>Pipelining: Basic Concepts, Data Hazards and Instruction Hazards. Introduction to GPU and GPU Computing. | 6 |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Computer Organization | 5th edition | V. Carl Hamacher, Zvonko Vranesic, | McGraw Hill Publications. |
| 2 | Computer Architecture: A Quantitative approach | 6th edition | John L. Hennessy, David A. Patterson | MK series in computer architecture and design |

**Reference Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Computer Organization and Architecture | 6th edition | Willaiam Staliing | Pearson Education |
| 2 | Computer Architecture & Organization | 3rd edition | J.P. Hayes | McGraw Hill Publications |

## III Semester

## CSE2202 : Object Oriented Programming

| Objective | Course Outcome |
|---|---|
| Student will :<br>1. Learn the Concepts of Java programming language<br>2. Learn Java's syntax, idioms, patterns, and styles to write simple JAVA program.<br>3. To develop object centric thinking and to use object oriented features of JAVA to write complex programs.<br>4. Learn the essentials of the Java class library, and learn how to learn about other parts of the library when you need them in application development | After completion of the course students will be able to:<br>1. Demonstrate the understanding of Object oriented concepts.<br>2. Analyse problem statement and identify appropriate objects and methods for problem solving.<br>3. Make use of predefined classes and frameworks for reducing coding efforts and improving performance.<br>4. Apply features of object oriented programming to write programs to solve real world problems. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | Introduction to object oriented programming paradigm, procedure oriented programming vs OOP, features of OOP, benefits of OOP, defining class, instantiating a class. Declaring Classes and objects, Creating Classes and objects, methods, argument passing, Recursion, this keyword, constructors ,Visibility control | 8 |
| 2 | Other Class Modifiers: static, final, Abstract, Method overloading, Super keyword, Overriding (polymorphism), nested inner classes, packages (encapsulation), Interfaces (multiple Inheritances) | 7 |
| 3 | Arrays, Strings Arrays, One Dimensional Arrays, Two Dimensional Arrays, variable size arrays, Strings and String Buffer classes, Wrapper Classes | 8 |
| 4 | exception handling mechanism: Fundamentals exception types, uncaught exception, try-catch Block, displaying description of an exception, multiple catch clauses, nested try-catch statements, throw, throws, finally, built in exceptions, creating own exception subclasses. Introduction to multithreading, life cycle of Thread, Runnable interface and Thread class. | 7 |
| 5 | Collection Vector and Framework: Introduction to collection framework, Vectors, Array List, Linked list, Hashset, Treeset, Hashmap, Accessing a collection via Iterator, Comparators. | 7 |
| 6 | IO Steam: Introduction to stream classes, use of stream classes,I/O stream, bytes stream, character stream, predefined stream, reading console input, reading character, reading string, writing console output, the print write class, reading & writing files, transient and volatile modifiers, Introduction to AWT, Working with Windows, Graphics and Text, Introduction to Swings. | 8 |

| Text Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Java Complete Reference | 7th | Herbert Schildt | McGraw-Hill |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Thinking in Java | 4th | Bruce Eckel | Prentice Hall |
| 2 | Programming with Java | - | E. Balagurusamy | TATA McGraw-Hill |

## III Semester

## CSE2203: Lab: Object Oriented Programming

| Sr. No. | Experiments based on |
|---|---|
| 1 | Implement the concept of Class and its data members and member functions in Java |
| 2 | Implement the concept of method overloading in Java |
| 3 | Implement the concept of class constructor and its type in Java |
| 4 | Implement the concept of Abstraction in Java |
| 5 | Implement the concept of all types of inheritance in Java |
| 6 | Implement the concept of arrays in Java |
| 7 | Implement the concept of run time polymorphism in Java |
| 8 | Implement the concept of Files in Java |
| 9 | Implement the concept of exception in Java |
| 10 | Implement the concept of swing to prepare a web application in Java |

## III Semester
## CSE2204: Data Structures I

| Objective | Course Outcome |
|---|---|
| 1. To make students familiar with syntaxes and usages of various programming constructs of C language<br>2. To make student understand concept of abstract data types like stacks and queues<br>3. To make student understand file handling operations<br>4. To create thinking ability needed for implementation of programming logic with proper use of memory | 1. To review programming concepts and understand fundamental concepts in data structures<br>2. To apply and analyse algorithms for performing operations on data structures<br>3. To Evaluate the performance of data structures and its applications.<br>4. Simulate the algorithms for performing operations on data structures. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | Types and operations, Iterative constructs and loop invariants, Quantifiers and loops, Structured programming and modular design, Illustrative examples, Scope rules, parameter passing mechanisms, recursion, program stack and function invocations including recursion | 6 |
| 2 | Overview of arrays and array based algorithms - searching and sorting: mergesort, quick sort, Sparse matrices. | 7 |
| 3 | Structures (Records) and array of structures (records). Database implementation using array of records. Dynamic memory allocation and deallocation. Dynamically allocated single and multi-dimensional arrays, polynomial representation. | 7 |
| 4 | Concept of an Abstract Data Type (ADT), Lists as dynamic structures, operations on lists, implementation of linked list using arrays and its operations. Introduction to linked list implementation using self-referential-structures/pointers. | 6 |
| 5 | Stack, Queues and its operations. Implementation of stacks and queues using both array-based and pointer-based structures. Applications of stacks and queues. | 6 |
| 6 | File organisation, examples of using file, file access methods , Hashing and collision resolution techniques | 6 |

**TEXT BOOKS:**

| Sr. No | Title | Authors | Edition (Year of Publication) | Publisher |
|---|---|---|---|---|
| 1 | Data Structures and Program Design in C | Robert Kruse, G. L. Tondo andB. Leung | latest edition | PHI-EEE |
| 2 | Fundamentals of Data Structures in C | Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed | latest edition | W. H. Freeman and Company. |
| 3 | How to Solve it by Computer | R. G. Dromey | latest edition | Pearson Education |

**Reference books**:

| Sr. No | Title | Authors | Edition (Year of Publication) | Publisher |
|---|---|---|---|---|
| 1 | Data Structures with C | Seymour Lipschutz | Latest | TMH |

## III Semester
## CSE2205: Lab.: Data Structures I

| Sr. No. | List of Experiment |
|---|---|
| 1 | C Programs for using various loop constructs |
| 2 | C Program for generating list |
| 3 | C Programs for illustrating recursion |
| 4 | C Programs for allocating memory dynamically for a single dimensional array and sorting it . |
| 5 | C Program for allocating memory dynamically for two-dimensional array , printing it |
| 6 | C Program to create a link list and print it. |
| 7 | C Program/s to create stack using array and link list |
| 8 | C Program/s to create Queue using array and link list |
| 9 | C Program to create file for storing , perform file operations |
| 10 | C Program on hashing |

## III Semester
## CSE2206: Lab: Software Lab-I

| Objective | Course Outcome |
|---|---|
| 1. Understanding data types, data structures, control and Loop statements in Python.<br>2. Learn def function definitions, and modules.<br>3. Learn basic object-oriented concepts using Python.<br>4. Developing applications in Python using customized and built in modules and packages. | After learning the course, the students will be able to<br>1. Understand the basic data types, built in data structures, control statements and loops and write simple programs in Python<br>2. understand the concepts of functions, modules and packages and write complex programs using them.<br>3. understand defining and handling Python objects and develop classes required for the given application<br>4. develop a useful application in Python. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | Introduction: Build-in Data types: Data type & Variables,, Python Strings, Python built in data structures: Lists, Dictionaries, Tuples, Sets, Arrays. Datatype conversion. Statements: Assignment statement, import statement, print statement, input statement, Python Control Statements: if, if – else, statements, Loop statements: For, while, continue and break, try and except statement, raise, with statements. | 4 |
| 2 | Python Functions, Modules and Packages: The def statement, returning values, parameters, arguments, local variables, global variables and global statement, doc strings for functions, Mathematical Function, Generating Random numbers, File Handling. | 3 |
| 3 | Python Object and Classes: defining classes and creating classes, member variables, Doc strings for classes, Private members, Python Operator Overloading, Python inheritance and polymorphism, Exception Handling, Python Modules and packages. | 2 |
| 4 | Developing applications in Python using built in and customized modules and packages. | 1 |

**BOOKS:**

| Sr. No | Title | Authors | Edition (Year of Publication) | Publisher |
|---|---|---|---|---|
| 1. | Learn Python Programming | Fabrizio Romano, Heinrich Kruger | Third Edition, 2020 | PACKT Publishing |
| 2. | Introduction to Computation and Programming Using Python | John V. Guttag | Second Edition,2016 | PHI EEE(MIT Press) |

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

*(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)*

**(Accredited 'A' Grade by NAAC with a score of 3.25)**

Hingna Road, Wanadongri, Nagpur - 441 110

# Bachelor of Technology

# SoE & Syllabus 2021

# 4th Semester

**(Department of Computer Science & Engineering**

## Computer Sciences & Engineering

After 26# A.C.

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. CSE-202.1

## B.TECH SCHEME OF EXAMINATION 2020-21

(Scheme of Examination w.e.f. 2022-23 onward)

## Computer Science & Engineering

| SN | Sem | Type | Course Code | Course Name | T/P | Contact Hours | | | | Credits | % Weightage | | | ESE Duration Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | T | P | Hrs | | MSEs* | TA** | ESE | |
| TOTAL FIRST & SECOND SEM | | | | | | | | | | 47 | | | | |
| **Third Semester** | | | | | | | | | | | | | | |
| 1 | 3 | BS | GE2201 | Engineering Mathematics III | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 3 | PC | CSE2201 | Computer Architecture and Organisation | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 3 | 3 | PC | CSE2202 | Object Oriented Programming | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 4 | 3 | PC | CSE2203 | Lab: Object Oriented Programming | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 5 | 3 | PC | CSE2204 | Data Structures I | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 6 | 3 | PC | CSE2205 | Lab: Data Structures I | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 7 | 3 | PC | CSE2206 | Lab: Software Laboratory | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| TOTAL | | | | | | 12 | 0 | 6 | 18 | 15 | | | | |
| **Fourth Semster** | | | | | | | | | | | | | | |
| 1 | 4 | BS | GE2207 | Discrete Mathematics & Graph Therory | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 4 | PC | CSE2251 | Operating Systems | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 3 | 4 | PC | CSE2252 | Lab:Operating Systems | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 4 | 4 | PC | CSE2253 | Data Structures II | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 5 | 4 | PC | CSE2254 | Lab: Data Structures II | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 6 | 4 | PC | CSE2255 | Introduction to Data Analysis | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 7 | 4 | PC | CSE2256 | Lab: Introduction to Data Analysis | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 8 | 4 | PC | CSE2257 | Theory of Computation | T | 4 | 0 | 0 | 4 | 4 | 30 | 20 | 50 | 3 Hours |
| TOTAL | | | | | | 16 | 0 | 6 | 22 | 19 | | | | |
| **Audit Courses** | | | | | | | | | | | | | | |
| 1 | 4 | HS | GE2121 | Env Studies for 4 Sem. CV,ME,EE,IT, CSE | T | 2 | 0 | 0 | | | | | | |
| 2 | 3 | HS | AU2123 | YCCE Communication Aptitude Preparation (YCAP3) | A | 3 | 0 | 0 | 3 | 0 | | | | |
| 3 | 4 | HS | AU2124 | YCCE Communication Aptitude Preparation (YCAP4.1) for CV,ME,CT,IT,CSE | A | 3 | 0 | 0 | 3 | 0 | | | | |

**MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment**

**TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance**

**TA** = for Practical : MSPA will be 15 marks each**

| | | | |
|---|---|---|---|
| | | June 2022 | 1.01 |
| Chairperson | Dean (Acad. Matters) | Date of Release | Version |

**Applicable for AY 2022-23 Onwards**

## IV Semester

## GE2207 – Discrete Mathematics & Graph Theory

| Course Objectives | Course Outcome |
|---|---|
| The objective of this paper is to study mathematical , logic and set theory and their methods of solution and graph theory, group theory with simple applications | With the completion of this syllabus students will be familiar with mathematical , logic and set theory and their methods of solutions and graph theory, group theory with simple applications |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | UNIT I: Mathematical Logic and Set Theory: Statement and Notation: Negation, Conjunction, Disjunction, Tautologies, Truth Tables, Basic Concepts of Set Theory, Inclusion & equality of set, Power Set, Ordered Pairs and n-tuples, Operations on Sets, Partial order, Equivalence relations, mathematical induction. Propositions, Predicate, logic, formal mathematical systems. (PO-1,2) | 6 |
| 2 | UNIT II: Relations and Functions: Relation and Ordering, Properties of Binary in a set, Relation Matrix and Graphs, Partition and Covering of a set, Equivalence relation, Partial ordering, Partially Ordered sets, Function (Definition and Introduction), Composition of functions, Inverse Functions, Characteristics function of a set.(PO-1) | 6 |
| 3 | UNIT III: Group Theory: Groups (Definitions and Examples) Subgroups and Homomorphism, Cosets and Lagrange's theorem, Normal subgroups, Codes and Group Codes. Semi groups and Monoids (definitions and examples). Homomorphism of semi groups and monoids, Sub semi groups and monoids.(PO-1) | 7 |
| 4 | UNIT IV: (PO-1)<br>Rings (Definitions and Examples): Integral domain, ring homomorphism, ideas of ring polynomial, Field, Lattice. | 7 |
| 5 | UNIT V: Fuzzy Sets and Fuzzy Logic : Fuzzy sets and systems, crisp sets, overview of fuzzy logic and classical logic, fuzzy compliment, fuzzy union, fuzzy intersection and combinations of these fuzzy sets operations crisp and fuzzy relations. | 6 |
| 6 | UNIT VI: Graph Theory: Basic concepts of graph theory, Basic definitions, Paths and circuits, Reach ability and connectedness, Matrix Representation of graphs, Tree and their representation and operations, Rooted trees, Path lengths in rooted trees, Multi graphs and weighted graphs, and graph isomorphism, shortest paths in weighted graphs, Hypergraphs, transitive closure, Spanning trees, Kruskal's algorithm, Prim's algorithm.(PO-1,2,3) | 7 |

| **Text Books** | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Discrete Mathematics Structure with application to Computer Science | 23rd re-print, 2005 | J. P. Tremblay & R. Manohar | Tata McGraw-Hills Publication Company Limited, New Delhi. |
| 2 | Advanced Engineering Mathematics | 8th revised edition, 2007 | H.K. Dass | by.S.Chand and Company Limited Delhi. |
| 3 | Fuzy Logic with Engineering Applications | - | T. J. Ross, | John Wiley &Sons, Ltd. ISBN: 978-81-265-3126-4 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Discrete Mathematics | 2nd edition | Lipschutz | by Schaums's Outline series,,Tata McGraw-Hills Publication Company Limited, New Delhi. |
| 2 | Discrete Mathematical structures | 3rd edition,2001, | Bernard Kolman ,Robert C.Busby,Sharon Ross, | Prentice Hall of India, New Delhi. |

## IV Semester

## CSE2251– Operating Systems

| Objective | Course Outcome |
|---|---|
| 1. To understand the role, components, and designing issues associated with operating systems.<br>2. To understand processes and threads, CPU scheduling algorithms, and process synchronization mechanisms<br>3. To comprehend the concepts of memory management including virtual memory.<br>4. To understand issues related to file system interface and implementation, and disk scheduling. | After undergoing this course student will be able to<br>1. Understand the fundamental concepts in Operating Systems (OS) and understand how various hardware features support OS functionality.<br>2. Explain various OS mechanisms and policies for managing system resources.<br>3. Analyse algorithms and techniques for managing various OS resources in a multiprogramming and other environments.<br>4. Evaluate the performance of algorithms for managing various OS resources. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | Introduction to OS: evolution of OS, basic hardware support necessary for modern operating systems, Layered Structural of OS, process concept, process state transitions , Services provided by OS, system calls, privileged instructions, Dual mode of operation, I/O bound and CPU bound processes, concept of multiprogramming and multiprocessing. | 5 |
| 2 | Process management: process control block, process context switch, process versus threads, CPU scheduling, goals of scheduling, CPU scheduling algorithms, Algorithmic evaluation of CPU scheduling algorithms, multi-queue scheduling, multithreading | 6 |
| 3 | Interprocess communication and Synchronization: Operations on processes, Interprocess communication, process cooperation and synchronization, race condition, critical region, mutual exclusion and implementation, semaphores, classic problems of Synchronization using semaphores, other synchronization constructs. | 7 |
| 4 | Memory management techniques: -contiguous allocation, static and dynamic partitioning, non-contiguous allocation, paging, translation look aside buffer (TLB) and overheads, segmentation. | 6 |
| 5 | Virtual memory: demand paging, page replacement algorithms, thrashing, working set model. Deadlocks: necessary conditions, deadlock detection, deadlock avoidance, deadlock prevention, recovery from deadlock. | 7 |
| 6 | File systems : introduction, Access methods, Directory Structure disk space management and space allocation strategies, disk arm scheduling strategies: FCFS, SSTF, SCAN, CSACN, LOOK, CLOOK, Selecting a disk scheduling algorithm. | 6 |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Operating system Principles | 9th Edition | A. Silberchatz and P.Galvin | John Wiley & Sons Inc. |

| | | | | |
|---|---|---|---|---|
|  |  | Jan 2021 | 1.00 | Applicable for AY 2021-22 Onwards |
| Chairperson | Dean (Acad. Matters) | Date of Release | Version | |

| | | | | |
|---|---|---|---|---|
| 2 | Operating Systems Internals and Design Principles | 2nd | William Staling | Pearson |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Operating Systems: A Design-Oriented Approach | - | -Charles Crowley | McGraw Hill |
| 2 | Operating system concepts and Design | 2nd | Milan MilenKovic | Tata McGraw Hill |

### IV Semester

### CSE2252– Lab.: Operating Systems

| Expt. No. | Name of Experiment / Problem Statement | Topic | CO Mapped |
|---|---|---|---|
| 1 | Study of Window task manager (Exploring various tabs: applications, processes, services, networking, performance) | Windows | CO-1 |
| 2 | Study of Advanced Linux shell commands (Process management, Memory management, Networking, etc.) | Linux Commands | CO-1 |
| 3 | Write a program that illustrates the creation of child process using fork system call. Each child and parent Processes perform different task. | Process Control | CO-1 |
| 4 | Write a multithreaded program to multiply two given matrices. | Threads | CO-1 |
| 5 | Simulate<br>a) any preemptive CPU Scheduling Algorithm<br>b) any Non-preemptive CPU Scheduling Algorithm | CPU Scheduling | CO-4 |
| 6 | Write a program to perform Inter-Process-Communication using shared memory or, pipes or message queues. | Inter-Process Communication | CO-4 |
| 7 | Write a program that solves two process Producer - Consumer problem with bounded buffer using semaphores.<br>OR<br>Write a program that gives a deadlock and starvation free solution to the Dining philosophers problem using semaphores | Semaphore | CO-4 |
| 8 | Simulate<br>a) First Fit (Static Memory allocation algorithm) and<br>b) Worst Fit (Dynamic Memory allocation algorithm) | Memory Allocation algorithms | CO-4 |
| 9 | Simulate any one of the following Page replacement algorithms:<br>FIFO, LRU, Optimal | Page Replacement Algorithms | CO-4 |
| 10 | Write a program to simulate Banker's Deadlock avoidance algorithm. | Deadlock | CO-4 |

## IV Semester
## CSE2253 – Data Structures II

| Objective | Course Outcome |
|---|---|
| 1. To get overview of fundamental data structures and their application<br>2. To explore different operations performed on various data structures<br>3. Understand practical implementation of different types of data structures<br>4. Comprehend working of advanced data structures like list, disjoint set, multidimensional trees<br>5. Compare different data structures | 1. Create and manipulate various data structures like linked list, disjoint sets, trees, graph for real world problem<br>2. Apply appropriate data structure for implementation of real world applications<br>3. Analyze the performance of operations performed on data structures.<br>4. Design application by using data structures for real world problems. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Linked Lists**- Singly-linked lists, doubly linked lists and circular linked lists. Operations on linked list: traversal, addition, deletion of nodes, list reversal, Applications of lists in polynomial representation, multi-precision arithmetic. Multi linked structures, implementation of priority queues. | 8 |
| 2 | **Sets**: data structures for disjoint set representation and operations, sorting, searching | 6 |
| 3 | **Binary Trees:** binary trees, binary trees- basic algorithms and various traversals. Binary Search Trees (BSTs) and insertion, deletion in BSTs. Heaps and heap sort | 8 |
| 4 | **Balanced trees**: Height-balanced (AVL) trees, Splay tree, Red-black trees, Multi-way trees-B and B+ and applications | 8 |
| 5 | **Multidimensional trees :**Tries and Pattern matching algorithms | 6 |
| 6 | **Graphs Representation & traversals**: Spanning trees, topological sort, shortest path algorithm, all-pairs shortest paths | 6 |

**TEXT BOOKS:**

| Sr. No | Title | Authors | Edition (Year of Publication) | Publisher |
|---|---|---|---|---|
| 1 | Data Structures and Program Design in C | Robert Kruse, G. L. Tondo andB. Leung | latest edition | PHI-EEE |
| 2 | Fundamentals of Data Structures in C | Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed | latest edition | W. H. Freeman and Company. |
| 3 | How to Solve it by Compute | R. G. Dromey | latest edition | Pearson Education |

**Reference books**:

| Sr. No | Title | Authors | Edition (Year of Publication) | Publisher |
|---|---|---|---|---|
| 1 | Data Structures with C | Seymour Lipschutz | Latest | TMH |

## IV Semester
## CSE2254 – Lab.: Data Structures II

| Sr. No. | List of Experiment |
|---|---|
| 1 | Program/s based on operations on singly linked list |
| 2 | Program/s based on operations on doubly linked list |
| 3 | Program based on Binary trees- traversal |
| 4 | Programs based on Binary search tree |
| 5 | Programs based on Tries |
| 6 | Program based on Balanced trees |
| 7 | programs based on Graph operations - traversal |

## IV Semester
## CSE2255 – Introduction to Data Analysis

| Course Learning Objectives | Course Outcomes |
|---|---|
| 1. To introduce the basic statistical formulae and visualization techniques<br>2. To comprehend the concepts of probability and probability distribution<br>3. To understand the concepts of sampling, sampling distribution and estimation<br>4. To understand the concept of hypothesis testing | Upon successful completion of the course students will be able to:<br>1. Apply fundamental concepts of statistics and probability for data analysis(PO1-3)<br>2. Apply appropriate statistical methods on simple datasets(PO2-3)<br>3. Formulate and solve problems in a systematic manner. (PO2-3)<br>4. Conduct investigation and Interpret output obtained from statistical analysis on datasets (PO4-3)<br>5. Obtain hands on experience with some popular software ( like R)for analysis and visualization of data( PO4-3,PO5-3) |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | INTRODUCTION TO STATISTICS & PROBABILITY: The role of statistics. Grouping and displaying data. Measures of central tendency and dispersion, Basic terminology in probability, probability rules, Probabilities under conditions of statistical independence, probabilities under conditions of statistical dependence. | 6 |
| 2 | PROBABILITY DISTRIBUTION: What is probability distribution, random variables, use of expected value in decision making, and various probability distributions :Binomial, Poisson, Uniform and Normal distributions. | 6 |
| 3 | SAMPLING DISTRIBUTION: Introduction to sampling distributions, sampling distribution of mean and proportion, application of central limit theorem, sampling techniques.<br>ESTIMATION THEORY: Estimation: Point and Interval estimates ,confidence intervals ,calculating interval estimates for population parameters of large sample and small samples, determining the sample size | 7 |
| 4 | TESTING OF HYPOTHESIS: Introduction, null hypothesis, tests of hypothesis and significance, type I and type II errors, one tailed and two tailed tests, p-value one sample tests for means and proportions of large samples (z-test), one sample tests for means of small samples (t-test), Chi-square tests for goodness of fit. Analysis of variance. | 7 |
| 5 | NON-PARAMETRIC METHODS: Sign test for paired data. Rank sum test. Mann –Whitney U test and Kruskal Wallis H test. One sample run test, rank correlation. Kolmogorov-Smirnov –test. | 6 |
| 6 | REGRESSION and CORRELATION: Estimation of regression line by least square method, linear regressions, Multivariate regression ,Correlation analysis, | 6 |

**Text Books:**

| Sr. No. | Title | Author | Edition | Publisher |
|---|---|---|---|---|
| 1 | Introduction to probability and statistics for engineers and scientist | Sheldon M. Ross | 3rd Edition | Elsevier |
| 2 | Statistics for Management | Richard I. Levin & David S. Rubin | 7th Edition | Pearson Education |
| 3 | Probability and Statistics | Murray R. Spiegel, John J.Schiller, R AluSrinivasan | Third edition . | Mc Graw Hill education |

**Reference Book:**

| Sr. No. | Title | Author | Edition | Publisher |
|---|---|---|---|---|
| 1 | Practical Statistics for Data Scientists, 50 Essential Concepts. | Peter Bruce & Andrew Bruce | | |
| 2 | An Introduction to Statistical Learning with Applications in R | Gareth James, Daniela Witten, Trevor Hastie & Robert Tibshirani | | |

## IV Semester

## CSE2256– Lab: Introduction to Data Analysis

| Sr. No. | List of Experiment |
|---|---|
| 1. | Implement basic functionality of R |
| 2. | Implement data import and export functionality in R |
| 3. | Implement R functions to calculate basic statistics of data source |
| 4. | Apply the visualization techniques in R to understand data |
| 5. | Solve the problems using probability distributions in R |
| 6. | Analyze the data using sampling technique |
| 7. | Analyze the data to find out estimated value |
| 8. | Analyze the data using hypothesis testing |
| 9. | Implement integration of R and java using packages |
| 10. | Case study on data analysis and visualization |

## IV Semester

## CSE2257– Theory of Computation

| Objective | Course Outcome |
|---|---|
| 1. To understand the basic properties of formal languages and Finite Automata, regular expression and Regular Grammar.<br>2. To study of different types of grammars and the properties of Context Free Grammar<br>3. To understand the basic properties of CFL and Designing of Push Down Automata<br>4. To understand the basic properties of Turing machine and study of Recursive Language, undecidability, post Correspondence problem and Recursive enumerable language | 1. Apply basic properties of formal languages and to design finite automata for regular expression and Regular Grammar.<br>2. Construct context free grammar for various languages.<br>3. Solve various problems of push down automata for context free language<br>4. Design Turing Machines for given any computational problem. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | Alphabet, Symbols, Sets, Strings, Language, Operations, Relations, Design of Finite State Machines, Acceptance of strings and languages, Non Deterministic Finite Automation, Deterministic Finite Automation, Equivalence between NFA and DFA, NFA with ε-transition, Minimization of FA. | 8 |
| 2 | Regular Regular sets, Regular expressions, Manipulation of regular expressions, Equivalence between RE and FA. Pumping Lemma, closure properties of regular sets, Regular grammars, Right linear and left linear regular grammars, inter-conversion between LLG & RLG, Equivalence between regular grammar and F.A., Inter-conversion between RE and RG. | 7 |
| 3 | Context free grammar, Derivation trees (Syntax tree and Parse tree), Ambiguous Grammar, Context Free Language (CFL), Normal Form of grammar: Chomsky Normal form, Greibach normal form. | 7 |
| 4 | Push down automata, definition, and model, acceptance of CFL by empty Stack and by final state, equivalence CFL and PDA, Inter-conversion, Closure of properties of CFL, DPDA & NDPDA. | 6 |
| 5 | Turing machine, Definition, Model of TM, Design of Turing Machine, Computable functions, Recursive enumerable language, Recursive Language, Properties of Recursive enumerable language, Church‟s hypothesis, Chomsky hierarchy of language, Linear bounded automata and context sensitive language, Universal Turing Machine | 6 |
| 6 | Un-decidability Problems related to Recursive enumerable language and Turing Machine, post correspondence problem. Recursive function Theory –Basis functions and operations on them. Bounded minimization preemptive μ recursive function unbounded minimization and recursive function | 6 |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Introduction to Automata Theory, Languages, and computation | 3rd Edition | Hopcroft J.E., Rajeev Motwani, Jeffrey D. Ullman | Pearson Education |
| 2 | Introduction to languages and the Theory of Computation | 3rd Edition | John C.Martin | Mc Graw Hill |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Introduction to the Theory of Computation | 2nd Edition | Michael Sipser | GALE CENGAGE Learning |
| 2 | Theory of Computation | 1st Edition | Dr. O. G. Kakde | Laxmi Publication |

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

*(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)*

**(Accredited 'A' Grade by NAAC with a score of 3.25)**

Hingna Road, Wanadongri, Nagpur - 441 110

# Bachelor of Technology

# SoE & Syllabus 2021

# 5th Semester

**(Department of Computer Science & Engineering**

## Computer Sciences & Engineering

28 June 2019

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. CSE-202.1

## B.TECH SCHEME OF EXAMINATION 2020-21

(Scheme of Examination w.e.f. 2022-23 onward)

## Computer Science & Engineering

| SN | Sem | Type | Course Code | Course Name | T/P | Contact Hours | | | | Credits | % Weightage | | | ESE Duration Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | T | P | Hrs | | MSEs* | TA** | ESE | |
| **Fifth Semester** | | | | | | | | | | | | | | |
| 1 | 5 | HS | GE2312 | Fundamentals of Economics | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 5 | PC | CSE2301 | Database Management Systems | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 3 | 5 | PC | CSE2302 | Lab: Database Management Systems | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 4 | 5 | PC | CSE2303 | Design & Analysis of Algorithms | **T** | 4 | 0 | 0 | 4 | 4 | 30 | 20 | 50 | 3 Hours |
| 5 | 5 | PC | CSE2304 | Lab: Design & Analysis of Algorithms | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 6 | 5 | PE | | Professional Elective-I | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 7 | 5 | PE | | Lab: Professional Elective-I | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 8 | 5 | OE | | Open Elective - I * | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 9 | 5 | OE | | Open Elective - II * | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 10 | **5/6** | **STR** | **CSE2310** | **Seminar** | **P** | **0** | **0** | **0** | **0** | **1** | | 100 | | |
| | | | | | **TOTAL** | **19** | **0** | **6** | **25** | **23** | | | | |

**Professional Electives -I**

| | | | | |
|---|---|---|---|---|
| 1 | 5 | PE-I | CSE2311 | PE I: Business Intelligence |
| | 5 | PE-I | CSE2312 | PE I: Lab: Business Intelligence |
| 2 | ~~5~~ | PE-I | CSE2313 | PE I: Web Technologies |
| | 5 | PE-I | CSE2314 | PE I: Lab: Web Technologies |
| 3 | 5 | PE-I | CSE2315 | PE I: Introduction to Geographical Information System |
| | 5 | PE-I | CSE2316 | PE I: Lab: Introduction to Geographical Information System |
| 4 | 5 | PE-I | CSE2317 | PE I: Mobile Operating System |
| | 5 | PE-I | CSE2318 | PE I: Lab: Mobile Operating System |

**Open Electives -I**

| | | | | |
|---|---|---|---|---|
| 1 | 5 | OE-I | CSE2331 | OE I: Database System Essentials |
| 2 | 5 | OE-I | CSE2332 | OE I: Introduction to Image Processing |
| 3 | 5 | OE-I | CSE2333 | OE I: Programming with Python |

**Open Electives -II**

| | | | | |
|---|---|---|---|---|
| 1 | 5 | OE-II | CSE2341 | OE II: Software Testing for Beginners |
| 2 | 5 | OE-II | CSE2342 | OE II: Introduction to Web Technology |
| 3 | 5 | OE-II | CSE2343 | OE II: Introduction to Cloud Computing |

| **Audit Courses** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5 | HS | AU2126 | YCCE Communication Aptitude Preparation (YCAP5.1) for CV,ME,CT,IT,CSE, IIoT, AIDS, CSD, AIML | **A** | 3 | 0 | 0 | 3 | 0 | |

**MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment**

**TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance**

**TA** = for Practical : MSPA will be 15 marks each**

| | | | |
|---|---|---|---|
| | | June 2022 | 1.01 |
| **Chairperson** | **Dean (Acad. Matters)** | **Date of Release** | **Version** |

**Applicable for AY 2022-23 Onwards**

## V Semester

## GE2312 Fundamentals of Economics

| Objective | Course Outcome |
|---|---|
| 1. Recognizes consumer's behaviour and pricing.<br>2. Extrapolates an operations in market with productions constrain.<br>3. Describes the national income accounting and public finance.<br>4. Interprets international trade and institutions. | Upon successful completion of the course, the student will be able to:<br><br>1. Discover the fundamental concept of Economics<br>2. Interpret the concept of micro -economics.<br>3. Generalize the ideas of macroeconomics.<br>4. Describe national and international trade |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Introduction to Economics and Consumers' Behaviours:** Definitions, meaning and importance of economics Utility analysis: concept and measurement (cardinal and ordinal), Law of diminishing marginal utility, exceptions to law of diminishing marginal utility, law of equi-marginal utility, Indifference curve analysis: Meaning and properties of indifference curve, marginal rate of substitution, budget constraint, Complement and substitute goods, Consumer's equilibrium. Demand Analysis: Meaning and determinants of demand, law of demand, exception to law of demand, Elasticity of Demand-price, cross and income elasticity, measurement of elasticity of demand. | 8 |
| 2 | **Production and Costs:** Factors of Production: Land, Labour, Capital, Enterprise and their peculiarities, Importance of Capital in production process. Entrepreneur and Innovations, Product and Process innovations, Concepts and types of costs: Fixed vs variable, total, average and marginal costs, Short run and long run cost curves. Law of Variable proportions (Law of diminishing marginal returns) and Return to Scale (Increasing, constant and decreasing), Economies and diseconomies of scale. Depreciation: Meaning and various method of calculating depreciation | 6 |
| 3 | **Market structures - equilibrium output and price:** Forms of market structures: Perfect competition, monopolistic competition, oligopoly, duopoly and monopoly, Demand and revenue curves for firm and industry in various forms of market structure, Total, average and marginal revenue curves, equilibrium of firms and industries under various forms of market structures, Price discrimination - Degrees and conditions of discrimination. | 7 |
| 4 | **National income accounting:** Concepts of GDP and GNP, Estimation of GDP and GDP at factor and market prices, at constant and current prices, difference between GDP and NDP, GNP and NNP, per capita income as a measure of economic well-being, concepts of economic growth and development, Factors affecting economic growth and development. Capital formation and accumulation. | 5 |
| 5 | **Money, Banking and Public Finance** Money: definition, functions and role, Evolution of money, Banking-reserve ratios and credit creation by commercial banks, Functions of a central bank and instruments of credit control, Functions of money market. Inflation: Meaning, types, causes and consequences, measures to control inflation, Concepts of deflation and Stagflation. Sources of public revenue and forms of government expenditure, Taxation: Cannons of taxation. Classification of taxes-Direct (Income tax, Wealth tax, Corporation tax, tax on capital, capital gains, etc) and Indirect Taxes (GST, Import duties), Revenue and capital expenditure. | 7 |

| | | |
|---|---|---|
| 6 | **International Trade and Institutions:** Definitions of closed vs. open economy, small open economy, Concept of exchange rate- Fixed, flexible and managed, Role of Multilateral institutions, viz., IMF, World Bank, WTO (GATT) in promoting, Trade, growth and international financial transactions. | 5 |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Modern Economics | 13th Edition | H. L. Ahuja | S. Chand Publisher |
| 2 | Modern Economic Theory | 3rd Edition | K. K. Devett | S. Chand Publisher |

**Reference Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Advance Economic Theory | 17th Edition | H. L. Ahuja | S. Chand Publisher |
| 2 | International Trade | 12th Edition | M. L. Zingan | Vindra Publication |
| 3 | Macro Economics | 11th Edition | M. L. Zingan | Vindra Publication |
| 4 | Monitory Economics | 1th Edition | M. L. Zingan | Himalaya Publisher |
| 5 | Economics of Development and Planning | 12th Edition | S. K. Misra and V. K. Puri | Himalaya Publishing House |
| 6 | Economics | | Samuelson | |

## V Semester

## CSE2301– Database Management Systems

| Objective | Course Outcome |
|---|---|
| 1. To learn different database system concepts<br>2. To learn the designing of Entity Relationship Diagram.<br>3. To know relational data model, relational algebra & SQL Queries.<br>4. To understand relational database design. To know about data integrity issues | Upon successful completion of the course, the student will be able to:<br>1. Analyze & compare different levels of abstraction & data independence.<br>2 .Design Entity Relationship Diagram for any scenario.<br>3. Solve queries based on relational algebra & SQL.<br>4. Identify functional dependencies & normalize the database and apply ACID properties.<br>5. Analyze transaction management, various concurrency control protocols and crash recovery methods. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Introduction to Database Management System:** General File System and Database system Concepts and Architecture, Data Models, Schemas and Instances, Abstraction & Different Levels of Data Abstraction, Data Independence: Logical & Physical Independence. | 5 |
| 2 | **Entity-Relationship Model**: Entities and Entity Sets, Relationships and Relationship Sets, Attributes, Mapping Constraints, Keys, Entity Relationship Diagram, Reducing E-R Diagrams to Tables, Generalization, Aggregation, Design of an E-R Database Scheme | 5 |
| 3 | **SQL:** Data definition language (DDL), Data Manipulation Language (DML), Basic structure of SQL Queries, Set operations, Null Values, Nested subqueries, views, modification of database, transaction, Joins.<br>**Advanced SQL:** SQL data types & schemas, Integrity Constraints, Domain Constraints, Assertions, triggers, Advanced SQL Features. | 6 |
| 4 | **Relational Data Model**: Structure of Relational Databases, **Relational Database Design**: Pitfalls in Relational Database Design, Functional Dependencies, Normalization using Functional Dependencies, Alternative Approaches to Database design. **Relational Algebra**: Structure of relational databases, Fundamental Relational-Algebra Operations, Additional relational algebra operations, extended relational algebra operations, modification of the databases | 7 |
| 5 | **Data Storage and Querying:** Storage and File Structure, Indexing and Hashing, Query Processing, query-evaluation.<br>**Transaction Management**: ACID Properties, Implementation of ACID Properties, Database processes to support ACID Properties, Schedules, and Testing of Serializability. | 7 |
| 6 | **Concurrency Control**: Lock-based Protocols, Timestamp Based Protocols, Validation Techniques, Multiple Granularity, Multi version Timestamp Protocol, Transaction isolation levels, Read consistency.<br>**Crash Recovery**: Failure Classification, Log Based Recovery, Buffer Management, Checkpoints, Shadow Paging. | 6 |

| Text Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Database System Concepts | latest | Korth, Silberschatz, sudarshan | McGraw-Hill publication |
| 2 | Fundamentals of Database Systems | latest | Elmasri, Navathe & Gupta | Pearson Education. |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | SQL & PL / SQL for Oracle 11g Black Book Kindle Edition | 3rd Edition | Dr. P.S. Deshpande | Dreamtech Press |
| 2 | Database Systems | 3rd Edition | Connolly, Begg | Pearson Education |
| 3 | Database Systems | 6th Edition | S. K. Singh, | Pearson Education |

## V Semester
## CSE2302– Lab.: Database Management Systems

| Sr. No. | List of Experiment |
|---|---|
| 1 | Creating a schema -To implement different basic Data Definition Language (DDL) & Data Manipulation Language(DML) Commands in SQL. |
| 2 | To design an ER Diagram. |
| 3 | Answer each of the following questions. The questions are based on the following relational schema:<br><br>Emp(*eid:* integer, *ename:* string, *age:* integer, *salary:* real)<br>Works(*eid:* integer, *did:* integer, *pcttime:* integer)<br>Dept(*did:* integer, *dname:* string, *budget:* real, *managerid:* integer)<br>a. Give an example of a foreign key constraint that involves the Dept relation. What are the options for enforcing this constraint when a user attempts to delete a Dept tuple?<br>b. Write the SQL statements required to create the preceding relations, including appropriate versions of all primary and foreign key integrity constraints.<br>c. Define the Dept relation in SQL so that every department is guaranteed to have a manager.<br>d. Write an SQL statement to add John Doe as an employee with *eid* = 101, *age* = 32 and *salary* = 15, 000.<br>e. Write an SQL statement to give every employee a 10 percent raise.<br>f. Write an SQL statement to delete the Toy department. |
| 4 | Given a schema , apply BETWEEN…AND, NOT BETWEEN, IN, NOT IN, IS NULL, IS NOT NULL clause on created database. |
| 5 | Given a schema , implement aggregate function & grouping commands. |
| 6 | Given a schema , implement basic set operations in SQL |
| 7 | Write the following queries in SQL for the following schema.<br>Suppliers(sid: integer, sname: string, address: string)<br>Parts(pid: integer, pname: string, color: string)<br>Catalog(sid: integer, pid: integer, cost: real)<br>1. Find the pnames of parts for which there is some supplier.<br>2. Find the snames of suppliers who supply every part.<br>3. Find the snames of suppliers who supply every red part. |

| | |
|---|---|
| | 4. Find the pnames of parts supplied by Acme Widget Suppliers and by no one else.<br>5. Find the sids of suppliers who supply a red part and a green part.<br>6. Find the sids of suppliers who charge more for some part than the average cost of that part (averaged over all the suppliers who supply that part).<br>7. For each part, find the sname of the supplier who charges the most for that part.<br>8. Find the sids of suppliers who supply only red parts. |
| 8 | To create and manipulate various database object of table using views. |
| 9 | To implement Transaction Control Language (TCL) commands. |
| 10 | To display file database connectivity using JDBC. |
| 11 | Write a program in PL/SQL to check given number is even or odd |

## V Semester

## CSE2303 - Design & Analysis of Algorithms

| Objective | Course Outcome |
|---|---|
| 1. To introduce basic algorithmic techniques, time requirements of an algorithm and mathematical techniques used in analysis of algorithms<br>2. Learn analysis of algorithms for a wide variety of foundational problems occurring in computer science applications with discussions on complexity and NP-completeness. | After completion of the course, student will be able to:<br><br>**CO1 :** Remember the concepts of algorithms,<br>**CO2 :** Understand time requirements of an algorithm and mathematical techniques used in analysis of algorithms.<br>**CO3 :** Analyze the Complexities of different algorithms for a wide variety of foundational problems occurring in computer science applications.<br>**CO4 :** Apply the knowledge of different algorithms with discussions on complexity.<br>**CO5 :** Evaluate the knowledge of algorithms with Complexity and NP-completeness. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | Mathematical foundations, summation of arithmetic and geometric series, Σn, Σn2, bound summations using integration, Analysis of algorithms, analyzing control structures, worst case and average case analysis, Asymptotic notations, Analysis of sorting algorithms such as selection sort, insertion sort, bubble sort, heap sort, external Sorting, lower bound proof. | 6 |
| 2 | Recursive functions and recurrence relations, solutions of recurrence relations using technique of characteristic equation and generating functions, elementary and advanced data structures with operations on them and their time complexity, Amortized analysis. | 7 |
| 3 | Divide and conquer basic strategy, binary search, quick sort, merge sort, Fast Fourier Transform etc. Greedy method –basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path etc. | 7 |
| 4 | Dynamic Programming basic strategy, multistage graphs, all pair shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem, Matrix Chain Multiplication, Longest Common Subsequent. | 6 |
| 5 | Basic Traversal and Search Techniques, breadth first search, connected components, Backtracking basic strategy, 8 – Queen‟s problem, graph colouring, Hamiltonian cycles etc. | 6 |
| 6 | NP-hard and NP-complete problems basic concepts, non-deterministic algorithms, NP-hard and NP- complete, Cook‟s Theorem, decision and optimization problems, polynomial reduction. | 6 |

| **Text Books** | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | Algorithm Design, | Latest edition | Klienberg and Tardos | Pearson |
| 2 | Computer Algorithms | Third | Horowitz, Sahani, Rajsekharan | Galgotia Publications Pvt. Ltd. |
| 3 | Introduction to Algorithms | Third | Thomas H. Cormen | Prentice Hall of India. |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Fundamentals of Algorithms | Second | Brassard and Bratley | Prentice Hall |

## V Semester

## CSE2304 – Lab.: Design & Analysis of Algorithms

| Sr. No. | List of Experiment |
|---|---|
| 1 | To Compute and Analyze its time complexity of various sorting algorithm.<br>• Bubble sort<br>• Insertion sort<br>• Selection Sort |
| 2 | To implement and compute time complexity of given problem using Divide and Conquer algorithm.<br>• Merge sort<br>• Quick sort<br>• Binary Search |
| 3 | To implement and compute time complexity of Job sequencing problem using Greedy Method for different number of inputs. |
| 4 | To implement and compute time complexity of Knapsack Problem using Greedy Method for different number of inputs. |
| 5 | To implement and compute time complexity of Dijikstra Problem using Greedy programming for different number of inputs. |
| 6 | To implement the given problem using minimum cost spanning trees.<br>• Kruskal Algorithm<br>• Prim Algorithm |
| 7 | To implement and compute time complexity of All Pair Shortest Path using dynamic programming for different number of inputs. |
| 8 | To implement and compute time complexity of Travelling Salesman Problem using dynamic programming for different number of inputs. |
| 9 | To implement and compute time complexity of 8 Queens's problem using backtracking for different number of inputs. |
| 10 | To implement and compute time complexity of Graph coloring problem using backtracking for different number of inputs. |

## V Semester

## CSE2311 – PE I: Business Intelligence

| Objective | Course Outcome |
|---|---|
| Student will :<br>1. Understand the business relevance and technical basics of business intelligence (BI), knowledge management (KM), and decision support and describe how OLAP is different from OLTP.<br>2. Appreciate the use of SQL for BI<br>3. Understand principles of dimensional modeling.<br>4. Understand Business intelligence system architecture, its building blocks, life cycle of a typical BI project<br>5. Get acquainted to popular BI tool for getting insight into the business data. | After completion of the course Students will be able to :<br>➢ Assemble BI as a Process, identify its application in various domains and functional area, its roles and responsibilities.<br>➢ Identify functions of building blocks in N_tier BI ecosystem<br>➢ Identify different stages in Lifecycle of a BI project.<br>➢ Differentiate between traditional BI and self-service BI (PO1-2)<br>1. Apply SQL as a universal language for BI (PO2-3)<br>2. Model a business scenario; identify the metrics, indicators, various dimensions, and aggregation strategies and make recommendations to achieve the business goal (PO3-3)<br>4.Obtain hands on experience with some popular BI software for analysis, reporting, visualization of results ( PO1-2, PO2-2,PO3-2,PO5-3) |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | Introduction to Business Intelligence : What is business intelligence, why do we need BI, EIS,MIS,DSS& BI, information pyramid-data, information, Knowledge & intelligence. Basis For operational, tactical & strategic decision making , OLTP vs. OLAP, Requirement gathering in BI through business question BI in various domains and functional area | 8 |
| 2 | SQL the universal language for Business Intelligence :Introduction to RDBMS, Language for retrieving data from a database,various clauses in a SQL retrieving data from multiple tables- joins filtering, sorting & grouping datasets, Introduction to DDL & DML statements, various built- in functions in SQL,Use of sub- queries,data dictionary and dynamic SQL. | 7 |
| 3 | Principles of Dimensional modeling: Foundation for fact based decision making, star and snowflake schema, Pros& cons of the star/snowflake schema dimensional model, Slowly changing dimension tables, Fact-less fact strategy, Time dimension. | 7 |

| | | |
|---|---|---|
| 4 | Business Intelligence system architecture: Need for enterprise class business intelligence infrastructure, The BI ecosystem, Building blocks of a n- tier BI system-servers & communication protocols ,The central repository-metadata, Information consumption user interfaces-desktop vs. web vs. Mobile. Open architecture, Scalability, performance in BI-in memory analytics. | 6 |
| 5 | BI Project Lifecycle :Typical BI project lifecycle, Requirements gathering & analysis-functional & non- functional requirements, reports and dashboards design- mock – up and storyboarding, Testing in a BI project, BI project deployment, Post production support, Applications of BI, BI best practices | 6 |
| 6 | Self-service Analytics : What is Self-service Analytics, What are the use cases of self-service analytics, Business Paradigm vs IT paradigm and the Paradigm Shift with self-service analytics, Challenges of Self-service Analytics. Introduction to MicroStrategy Desktop – Overview | 6 |

Text Books

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Data Warehousing ETL toolkit, Indian edition. | Latest | Ralph Kimball and Margy Ross | wiley |
| 2 | Fundamentals of Business Analytics | Latest | R.N.Prasad, Seema Acharya | wiley |
| 3 | Business Intelligence: The Savvy Manager's Guide | Latest | David Loshin | |

Reference Books

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Data Warehousing in the real world A practical guide for building Decision Support System | | Sam Anahory, Dennis Murray, | PEARSON |

## V Semester

## CSE2312 – PE I: Lab: Business Intelligence

| Sr. No. | Name of Practical |
|---|---|
| 1 | Exploring HR schema of Oracle, Implementation of queries based on range, relational operators, sorting, and concatenation. |
| 2 | Implementation of queries based on character matching, aggregate functions, set operations |
| 3 | Implementation of queries based on Joins (joining 2 or more tables), sub queries. |
| 4 | a. Design a multidimensional data cube for given data Using EXCEL<br>b. Perform OLAP- slicing operation on it |
| 5 | Creation Of Dashboard Using EXCEL |
| 6 | Exploring Tableau OR/ MICROSTRATEGY ANALYTIC DESKTOP (MSTR) : Installation tool,Importing Data from file, Data Wrangling (Editing Data). |
| 7 | Visualization Of Data Using different visualizations in Tableau/ MSTR analytic desktop, Filtering data, and delivering Insights from data |
| 8 | Create reports and Dashboard with defined insights /requirements in Tableau/MSTR analytic desktop. (Sample Data to be provided) |

## V Semester

## CSE2313 – PE I: Web Technologies

| Objective | Course Outcome |
|---|---|
| 1. To learn basic aspects of Web services, Server side scripting, Advanced CSS<br>2. To introduce with AJAX<br>3. To learn Basics of Advanced Client side programming<br>4. To learn JavaScript | On completion of this course, the student will be able to<br>1. Design Web pages using HTML.<br>2. Build an interactive website with CSS3<br>3. Develop basic programming skills using JavaScript<br>4. Use features of Client side programming |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Web Essentials**: Clients, Servers, and Communication, Overview of Internet, Intranet, Basic Internet Protocols (HTTP, FTP, SMTP), WWW, HTTP: HTTP Request and Response message, Client Side Scripting, Server Side Scripting. | **6 Hours** |
| 2 | **Hyper Text Markup Language (HTML5):** Structure of an HTML Program, Basic HTML Tags (Headings, Paragraph, Division, Text formatting, Image element, Anchors), HTML Lists (Ordered Lists, Unordered Lists, Description Lists), HTML Links (Href Attribute, Target Attribute), HTML colors, Table handling in HTML, HTML Layout Elements (Semantic Elements), HTML Style Attribute, HTML class and id Attribute, HTML Forms, HTML Media(video, audio, YouTube). | **6 Hours** |
| 3 | **Cascading Style Sheets (CSS3):** Introduction to CSS3, Differences between CSS3 and earlier CSS specifications, Inserting CSS: Inline, Internal, External, CSS3 selectors, CSS3- Colors, Backgrounds, Borders, Text, Font, List, CSS3 Box Model, CSS3 Navigation Bar (Vertical, Horizontal), Media Queries, Basics of Responsive Web Designs, Introduction to Bootstrap. | **6 Hours** |
| 4 | **Client Side Scripting with JavaScript:** Introduction to JavaScript, Variables and Data Types, Operators and Expressions in JavaScript, Functions In JavaScript, Arrays, Loops and control statement, RegExp, Dialog Boxes, JavaScript Events. Event Handling and Form Validation, Error Handling, Handling Cookies, XML, JSON. Introduction to Web Frameworks- React JS, Angular JS. | **6 Hours** |
| 5 | **Advanced Client side programming**: WebSockets, Server-Sent Event (SSE), WebRTC, Web Graphics & Canvas, WebGL, WebWorkers, SVG. Libraries: Modernizr, Polyfills, Polymer. | **6 Hours** |
| 6 | Server Side Programming: Introduction to the server-side programming, Server-side web frameworks like Node JS/Express JS, Django. etc. | **6 Hours** |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX | latest | - | Kogent Learning Solutions Inc. |

| **Reference Books** | | | | |
|---|---|---|---|---|
| SN | Title | Edition | Authors | Publisher |
| 1 | HTML & CSS: The Complete Reference | Fifth Edition | Thomas A. Powell | The McGraw-Hill Companies, Inc. |
| 2 | Web Technologies | latest | Ivan Bayross | BPB Publication |

| **MOOCs Links and additional reading, learning, video material** | |
|---|---|
| 1 | https://nptel.ac.in/courses/106105084 |
| 2 | https://www.youtube.com/watch?v=uUhOEj4z8Fo |
| 3 | https://www.w3schools.com/js/js_events.asp |

## V Semester

## CSE2314 – PE I: Lab: Web Technologies

**Course Objectives:**

Student will:

1. To introduce with the internet technology
2. To study the basic of web page designing
3. To introduce the validations in the web page
4. To introduce the concepts of data storage using XML
5. To learn the advance technique for designing the interactive web page

**Course Outcomes:**

Upon successful completion of the course students will be able to

1. Understand various internet technologies
2. To design the web pages using some basic techniques
3. To design and implement the interactive web pages
4. To use the XML technology to store the data
5. To design and develop the interactive web pages using the advanced technique

| Sr. No. | List of Experiment |
|---|---|
| 1 | Implement basic HTML Tags.<br><br>Write a HTML code to illustrate the usage of the following - Ordered Lists - Unordered Lists - Description Lists |
| 2 | Write a HTML code to display data in tabular form (row* column) using HTML table tags |
| | Write a HTML code to create a home page having three links: About us, Services and Contact us create separate web pages for the three links. |
| 3 | Create web forms by using form tags in HTML. (Use any example) |
| 4 | Develop and demonstrate the usage of inline, internal and external style sheet using CSS3. |
| 5 | Create a single page responsive website using Bootstrap |

| | |
|---|---|
| 6 | Write JavaScript to validate the following fields of the Registration page.<br>1. First Name (Name should contains alphabets and the length should not be less than 6 characters).<br>2. Password (Password should not be less than 6 characters length).<br><br>3. E-mail id (should not contain any invalid andmust follow the standard pattern name@domain.com)<br><br>4. Mobile Number (Phone number should contain 10 digits only).<br><br>5. Last Name and Address (should not be Empty). |
| 7 | Create a simple script to download images using AJAX<br><br>Or<br><br>Develop and demonstrate the usage of jQuery |
| 8 | Introduction to XML program to demonstrate the use of External and Internal DTD |
| 9 | Create a web page which show the use of Canvas & SVG. |
| 10 | Develop a small web application using suitable web service framework and implement it. |

## V Semester

## CSE2315 – PE I: Introduction to Geographical Information System

| Objective | Course Outcomes |
|---|---|
| 1) Get overview of fundamental concepts of GIS, applications and study.<br>2) Explore the Coordinate Systems, Map Projections metadata, spatial data, spatial analysis and new trends in GIS.<br>3) Comprehend the Making and sharing of maps. | **On completion of this course, the student will be able to:**<br>1) Demonstrate the fundamental concepts of GIS and relate the various GIS applications used by industries and government organization<br>2) Develop the apprehension of Coordinate Systems, Map Projections, metadata, spatial data, spatial analysis and new trends in GIS.<br>3) Design and share maps |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Introduction to GIS:** Concepts of GIS, Applications currently used by Industry &Govt and their common usages. Fundamental concepts of GIS: GIS terminologies, various components of GIS software and types of GIS applications. The GIS Software Market, Role of GIS in smart cities. | 6 |
| 2 | **Fundamentals of Coordinate Systems and Map Projections**: History of Coordinate Systems, Geographic Coordinate Systems, Map Projections and Geo referencing. | 7 |
| 3 | **Fundamentals of Spatial Data:** Introduction to Spatial Data Formats, Creation of Vector data, Organization of Spatial Data and Displaying Spatial Data, metadata and spatial data standards. | 7 |
| 4 | **Making Sharing Maps:** Map Creation and Design, Sharing Maps as Services, Sharing Spatial Data and using shared Spatial Data. | 6 |
| 5 | **Fundamentals of Spatial Analysis:** Spatial Analysis, analyzing Vector and Raster data, overview of analysis tools, analyzing Spatial Relationships and sharing Analysis Results | 7 |
| 6 | **New trends in GIS:** GIS Trends Changing the World, Machine learning in GIS, Geospatial big data, Integration of GIS with different technologies, GIS with LiDar data. | 7 |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | An Introduction to Geographical Information Systems | 3rd t Edition(2006) | D. Ian Heywood, Sarah Cornelius & Steve Carver | Pearson Prentice Hall |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Getting to Know ArcGIS | 4th Edition(2015) | Michael Law & Amy Collins | Esri Press |
| 2 | Mathematical Modeling in Geographical Information System global Positioning System and Digital Cartography | 4th Edition(2006) | H. S. Shrama, D. R.Ram, Rama Prasad & P. R. Binda | Concept Publishing Company |

## V Semester

## CSE2316 – PE I: Lab: Introduction to Geographical Information System

| Sr. No. | Aim of Practical |
|---|---|
| 1 | To explore different proprietary GIS and Open GIS software. |
| 2 | To study the installation of GIS Desktop Software and explore various components of the GIS Desktop Software. |
| 3 | To explore various coordinate systems. Download any shape file and explore its coordinate system and change the existing coordinate system. |
| 4 | To create Geodatabase, layer files and shape files from the scratch. |
| 5 | To explore data formats using GIS Desktop Software and vector data points such as points, lines and polygon and create the map using simple vector data structure. |
| 6 | To create map in data view and layout view. |
| 7 | To install GIS Server, creating web services out of GIS maps or data, Sharing maps, using GIS web services. |
| 8 | Geoprocessing tools |
| 9 | Model builder |
| 10 | Project |

## V Semester

## CSE2317 – PE I: Mobile Operating System

| Course Outcomes: |
|---|
| **Upon successful completion of the course the students will be able to**<br>1. Understand the basics of mobile programming.<br>2. Apply mobile programming concepts.<br>3. Design user interfaces.<br>4. Design mobile database.<br>5. Analyse inter – application communication. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Introduction to Mobile Programming**<br>Mobility Technology Trends, Mobile Ecosystem Overview, Mobile Devices Overview, Mobile Development, Methodology, Wireless Networks Overview, Proximity Technologies. | 5 |
| 2 | **Introduction to Android**<br>Android Overview, Basic building blocks, Introduction to Activities/Fragments, Introduction to Services, broadcast receivers, content providers, Android Application Structure, Source Files, Resources, Assets, Manifest, Basic IDE Operation (Android Studio), Project Creation and Handling (App Creation through Wizard), Running App on AVD and Device, DDMS and Debugging, Layout Overview, Linear Layout, Relative Layout, Frame Layout, Widgets (UI Controls) Overview, Text View, Image View, button. | 6 |
| 3 | **User Interface Designing**<br>Notifications, Toast, Dialog, Listview and Adapter, View Re-usability, Spinner, Complex View, Android Component overview, Intent Resolution, Activity Stack, Launch Modes , Activity Flags, Service Overview, Service Lifecycle, Service Usage and Applicability, Message Binder. | 6 |
| 4 | **Data Management**<br>Data Storage Overview, Persistant v/s Local, Shared Preferences, Internal Storage, SQLite Data Base, Thread, process overview, Async Task, Loaders, Handlers, Intent and Intent Filters, Broadcast receiver Overview, Manifest Registration vs Component Registration, Unregistration, SMS, Boot, Network etc., Action Bar and Context Menu. | 6 |
| 5 | **Inter - Application Communication**<br>Inter app communication requirement overview, Intents Based, Gallery, Camera, SMS App, Contacts, Content provider Overview ,Need and Usage, Content Provider structure, URI Permissions, Views, triggers, Network communication basics, Connecting to server/ request creation, Response Formats XML/JSON, Rest / Web | 6 |

| | | |
|---|---|---|
| | Services. | |
| 6 | **Advanced User Interface Designing**<br>Style and Themes, View and layout animation, Localization, Orientation and Config Change Handling, Handling multiple resolution devices, Device and Tablet consideration, Support Library, Application Signing, Application Distribution, Application Publishing, Google Play, Query solving topics, Recycling view adapter, SQLite DB, Drawer, Tab Layout (view Pager 2), http request using retrofit, Navigation Drawer, Android Application Architecture and Unit Testing, Introduction to Jetpack, Introduction to Daggers, Introduction to AndroidX | 7 |

**Reference Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Programming the Mobile Web | 2nd ed., 2013 | Maximiliano Firtman | O'Reilly Media, Inc. |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Mobile Design and Development | 2009 | Brian Fling | O'Reilly Media, Inc |
| 2 | Android Programming: The Big Nerd Ranch Guide | 2nd edition, 2015 | Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano | Big Nerd Ranch LLC |

## V Semester

## CSE2318 PE I: Mobile Operating System Lab

| Sr. No. | Experiments based on |
|---|---|
| 1 | Study of Mobile devices & their history. |
| 2 | Study of Mobile Apps Architecture. |
| 3 | Installation of Android Studio. |
| 4 | Modification to AndroidManifest File. |
| 5 | Develop an app making use of Android layout. |
| 6 | Develop an app based on Android widgets. |
| 7 | Design & Develop an app making use of Event Handling. |
| 8 | Develop an app to demonstrate fragment manager. |
| 9 | Design & Develop an app making use of mobile database. |
| 10 | Design & Develop an app based on inter application communication. |

## V Semester

## CSE2331 – OE I: Database System Essentials

| Objective | Course Outcome |
|---|---|
| To understand basic database concepts by students whose basic degree is not in Computer or IT. | Upon successful completion of the course the students will be able to<br>1. Understand the basics concepts of Database System and its modelling, compare SQL and NoSQL databases.<br>2. Solve queries based on SQL and procedures using PL-SQL, & Analyse data dependencies & normalization.<br>3. Understand Query Processing and evaluate queries.<br>4. Understand ACID Properties and database system Architecture. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| Unit:1 | **Database system Essentials**: Purpose of Database systems, Example of Database Applications, Basic Terminologies, Data Models, Entity–Relationship Model, Relational Model. | 6 Hours |
| Unit:2 | **Relational Databases:** Introduction, SQL, DDL, DML, DCL, Database Integrity and Security, Relational–Database Design, Object–Oriented Databases, Object–Relational Databases, database constraints, functional dependencies and normalization. | 7 Hours |
| Unit:3 | **Data Storage and Querying:** Storage and File Structure, Indexing and Hashing, Data Retrieval, Query Processing, data-access techniques, query-evaluation. | 6 Hours |
| Unit:4 | **Transaction Management**: Introduction, transaction atomicity, consistency, isolation, and durability, concurrency control, serializability, locking, time stamping. Deadlock issues. | 6 Hours |
| Unit:5 | **Database System Architecture**: Centralized systems, client–server systems, parallel and distributed architectures, and network types, | 6 Hours |
| Unit :6 | **PL-SQL and No SQL:** Introduction to Pl-SQL, Block Structure: Variables, Decision Structures & Loops, Basic Pl-SQL programming.<br>Overview of NoSQL Databases, SQL Vs NO SQL, Types of NoSQL Database | 5 Hours |

| **Text Books** | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | Database System Concepts | 7th Edition | Silberschatz–Korth–Sudarshan | McGraw–Hill, 2019 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | Fundamentals of Database Systems | 5th Edition | Elmasri, Navathe & Gupta | Pearson Education |
| **2** | Database Systems | 5th Edition | S. K. Singh | Pearson Education |

| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
|---|---|
| 1 | http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 |
| 2 | https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042 |
| **MOOCs Links and additional reading, learning, video material** | |
| 1 | https://onlinecourses.nptel.ac.in/noc21_cs04/preview |
| 2 | https://onlinecourses.nptel.ac.in/noc22_cs80/preview |

## V Semester

## CSE2332 – OE I: Introduction to Image Processing

| Objective | Course Outcome |
|---|---|
| 1. Overview the Fundamental concepts of Digital Image Processing<br>2. Explore image enhancement techniques in spatial domain and frequency domain<br>3. Understand the fundamental concept of image compression<br>4. To Study various similarity based, and dissimilarity-based image segmentation approaches.<br>5. Understand the basic concepts of image representation and description. | Upon successful completion of the course the students will be able to<br>CO1: Understand basic principles of image processing.<br>CO2: Analyze images using processing algorithms/Techniques.<br>CO3: Apply the concepts to implements basic image processing algorithms/operations. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| Unit:1 | Fundamentals of Image Processing: Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations. | 6 Hours |
| Unit:2 | Image Transformations: Image Enhancement in the Spatial Domain: Basic Grey Level Transformations, Histogram Processing, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters. | 7 Hours |
| Unit:3 | Image Processing: Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation | 6 Hours |
| Unit:4 | Image Segmentation :Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds | 6 Hours |
| Unit:5 | Image Compression: Image Compression: Fundamentals, Some Basic Compression Methods -Run Length Coding, Huffman Coding, Arithmetic Coding, Bit Plane Coding, Block Truncation Coding. JPEG Compression. | 6 Hours |
| Unit :6 | Morphological Image Processing: Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, Hit or Miss Transformation, Some Basic Morphological Algorithms, Grey Scale Morphology. | 6 Hours |

| Text Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Digital Image Processing, (DIP/3e) | | Gonzalez and Woods | Prentice Hall - 2008 |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Digital Image Processing | | Kenneth R Castleman | Pearson Education |
| 2 | Fundamentals of Digital image Processing | | Anil Jain.K | Prentice Hall of India |
| 3 | Digital Image Processing | | S Jayaraman | Mc Graw Hill India 2017. |

| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
|---|---|
| 1 | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/ |
| **MOOCs Links and additional reading, learning, video material** | |
| 1 | https://onlinecourses.nptel.ac.in/noc21_cs04/preview |
| 2 | https://onlinecourses.nptel.ac.in/noc22_cs80/preview |

## V Semester

## CSE2333 – OE I: Programming with Python

| CSE 2333 | Programming with Python | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

| Course Outcomes |
|---|
| Upon successful completion of the course the students will be able to :<br>1. Understand the basic data types, built in data structures, control statements and loops and write simple programs in Python.<br>2. Understand and apply the concepts of functions, modules and packages and write programs using them.<br>3. Design and develop classes in Python.<br>4. Solve real world problems and develop applications using Python. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| Unit:1 | **Introduction to Python**: Build-in Data types & variables, arithmetic operators, assignment statement, print & input function, relational and logical operators, if, if – else & nested if- else statements, writing simple programs. | 6 Hours |
| Unit:2 | **Data Structures:** Built in data structures: Lists, Dictionaries, Tuples, Sets, and Arrays,mutability. Programs based on the built-in data structures | 6 Hours |
| Unit:3 | **Looping: Loop statements:** For, while, continue and break statements, list comprehension. Bitwise operators, Real world problem solving | 6 Hours |
| Unit:4 | **Functions:** Library functions in Python standard library, user defined Functions, returning values, local & global variables, global statement, doc strings for functions, developing useful functions, Modules and Packages, using import statement | 6 Hours |
| Unit:5 | **Introduction to Object oriented programming in Python:** Features of object-oriented programming, Python Object and Classes: defining classes, member variables, doc strings for classes, Private members, Operator Overloading, inheritance, and polymorphism | 6 Hours |
| Unit:6 | **Application Development:** Data visualization, basic file handling, Exception handling, developing applications in Python | 6 Hours |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Learn Python Programming | Third Edition | Fabrizio Romano, Heinrich Kruger | PACKT Publishing |

| | | | | |
|---|---|---|---|---|
| | | Jan 2021 | 1.00 | Applicable for AY 2021-22 Onwards |
| Chairperson | Dean (Acad. Matters) | Date of Release | Version | |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Introduction to Computation and Programming Using Python | Second Edition | John V. Guttag | PHI EEE (MIT Press) |

| MOOCs Links and additional reading, learning, video material | |
|---|---|
| 1 | https://onlinecourses.nptel.ac.in/noc20_cs70/preview |
| 2 | https://onlinecourses.nptel.ac.in/noc20_cs83/preview |

## V Semester

## CSE2341 – OE II: Software Testing for Beginners

| Objective | Course Outcome |
|---|---|
| 1. Understand Software testing fundamentals / principles.<br>2. Learn systematic approach to software testing using strategies.<br>3. Explore Methods and tools of testing software. | Upon successful completion of this course, the student will be able to:<br>1. Formulate problem by following Software testing life cycle.<br>2. Design Manual Test cases for Software Project.<br>3. Demonstrate utilization of testing automation though testing tool. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Software Testing Basics:** Basic concepts of Testing: Need of Testing, Basic concepts-errors, faults, defects, failures, objective of testing, central issue in testing, Testing activities, V-Model, Sources of information for test cases, Monitoring and Measuring Test Execution, Test tools and Automation, Limitation of Testing. | 6 |
| 2 | **Unit Testing:** Unit Testing: Concepts of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging, Tools for Unit Testing. | 6 |
| 3 | **Control Flow Testing:** Control Flow Testing: Outline of Control Flow Testing, Control Flow Graphs, Path in Control Flow Graph, Path selection criteria, All path coverage criteria, Statement coverage, Path coverage. | 7 |
| 4 | **Integration Testing:** Data Flow and System Integration Testing: Introduction Data flow testing, Data flow graph, Data flow testing criteria, Fundamentals of System Integration: Types of interfaces and interface errors, System integration testing, Software and Hardware integration. | 7 |
| 5 | **System Testing:** System Testing: Taxonomy of system test, Basic Test, Functionality test, Robustness test, Performance test, Scalability test, Stress test, Load and Stability test, Reliability test, Regression test, Documentation Test. | 6 |
| 6 | **Test Cases:** Test Design: Test cases, Necessity of test case documentation, Test case design methods, Functional specification-based test case design, Use case bases, application based test case design, level of test execution. | 6 |

| Text Books | | | | |
|---|---|---|---|---|
| **S.No** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Software Testing and Quality Assurance | | Kshirsagar Naik and PriyadarshiniTripathi | Wiley Publication |
| 2 | Software Testing Principles, Techniques and Tools | | M.G. Limaye | McGraw Hills |

| Reference Books | | | | |
|---|---|---|---|---|
| **S.No** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | Foundations of Software Testing | | Aditya P. Mathur | Pearson Education |
| **2** | Software Testing Tools | | Dr. K. V. K. K. Prasad | Dream Tech |

| MOOCs Links and additional reading, learning, video material | |
|---|---|
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs13/preview |
| **2** | https://onlinecourses.nptel.ac.in/noc19_cs71/preview |

## V Semester

## CSE2342 – OE II: Introduction to Web Technology

| Course Outcomes: |
|---|
| Upon successful completion of the course the students will be able to<br>1. Design Web pages using HTML5<br>2. Build an interactive website with CSS3<br>3. Develop basic programming skills using JavaScript<br>4. Create XML documents and Schemas. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| Unit:1 | **Introduction to internet:** Overview of Internet, Intranet, WWW, Internet Protocols (HTTP, FTP, SMTP), Email, broadband. | 6 Hours |
| Unit:2 | **Introduction to HTML5:** Web server, Web Client/Browser, Structure of an HTML Program, Basic HTML Tags( Headings, Paragraph, Division, Text formatting, Image, Anchors), HTML Lists (Ordered Lists, Unordered Lists, Description Lists), HTML Attributes, HTML Links (Href Attribute, Target Attribute). | 6 Hours |
| Unit:3 | **Table handling in HTML and Creating Forms:** Table handling in HTML: width and border attribute, CELLPADDING attribute, CELLSPACING attribute, COLSPAN and ROWSPAN attributes, background color attribute, HTML Forms: Elements to Capturing Form Data, Properties of Form Elements, HTML Layout Elements(Semantic Elements), HTML style attribute, HTML class and id attribute. | 6 Hours |
| Unit:4 | **Cascading Style Sheets (CSS3):** Introduction to CSS, Differences between CSS3 and earlier CSS specifications, CSS Syntax, CSS selectors, Inserting CSS: Inline, Internal, External, CSS properties: Background, Text, Font, Border, Margin, Padding, List, Dimension, and Classification. | 6 Hours |
| Unit:5 | **Java Script:** Introduction to Java Script, Functions of Javascript, Variables and Data Types, Operators, Loops and control statement: if Statement, if...else Statement, else if Statement, JavaScript Switch Statement, JavaScript Functions, JavaScript Loops: for loop, while loop, do...while loop, Dialog Boxes, JavaScript Events. | 6 Hours |
| Unit :6 | **Introduction to XML:** What is XML?, Features of XML, XML Syntax and Structure Rules(Start tags, End tags, Empty elements, XML tag attributes),XML Document Type Declaration(DTD, Internal DTD's, External DTD's. | 6 Hours |

| Text Books | | | | |
|---|---|---|---|---|
| **S No** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX | | | Kogent Learning Solutions Inc. |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **S No** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | HTML & CSS: The Complete Reference | Fifth Edition | Thomas A. Powell | The McGraw-Hill Companies, Inc |
| **2** | Web Technologies | | Ivan Bayross | BPB Publication |

| **MOOCs Links and additional reading, learning, video material** | |
|---|---|
| 1 | https://nptel.ac.in/courses/106105084 |
| 2 | https://www.youtube.com/watch?v=uUhOEj4z8Fo |
| 3 | https://www.youtube.com/watch?v=mU6anWqZJcc |

## V Semester

## CSE2343 – OE II: Introduction to Cloud Computing

| Course Outcomes: |
|---|
| Upon successful completion of the course the students will be able to<br>1. Understand Cloud Computing Models.<br>2. Apply Cloud Concepts &Technologies.<br>3. Analyse Cloud Services & Platforms<br>4. Use MapReduce to process Big Data on Apache Hadoop. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| Unit:1 | **Introduction to Cloud Computing:** Definition of Cloud Computing, Characteristics of Cloud Computing, Cloud Models (Service & Deployment), Cloud Services Examples (IaaS, PaaS, SaaS), Cloud-based Services and Applications (Cloud computing for Healthcare, Manufacturing Industry and Education) | 6 Hours |
| Unit:2 | **Cloud Concepts &Technologies:** Virtualization, Load balancing, Scalability & Elasticity, Monitoring, Identity & Access Management, Service Level Agreements | 6 Hours |
| Unit:3 | **Cloud Services & Platforms:** Compute Services (Amazon Elastic Compute Cloud, Google Compute Engine, Windows Azure Virtual Machines), Storage Services (Amazon Simple Storage services, Google Cloud Storage, Windows Azure Storage), Database Services (Amazon Relational Data Store, Google Cloud SQL, Windows Azure SQL Database), Application Services (Application Runtimes & Frameworks) Identity & Access Management Services ( Amazon Identity & Access Management, Windows Azure Active Directory). | 6 Hours |
| Unit:4 | **Hadoop & MapReduce:** Apache Hadoop, Hadoop MapReduce Job Execution, NameNode, Secondary NameNode, JobTracker, TaskTracker, DataNode | 6 Hours |
| Unit:5 | **Cloud Application Design:** Design Considerations for Cloud Applications, Scalability, Reliability & Availability, Security, IaaS, SaaS Services for Cloud Applications. | 6 Hours |
| Unit :6 | **Cloud Security:** Introduction, CSA Cloud Security Architecture, Authentication, Single Sign On (SSO), Authorization. | 6 Hours |

| **Text Books** | | | | |
|---|---|---|---|---|
| **S.No** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | CLOUD COMPUTING A Hands -on Approach | | Arshdeep Bahga & Vijay Madisetti | Wiley Publication |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **S.No** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | CLOUD COMPUTING | **18th edition** | Michael Miller | PEARSON PUBLICATION |
| **2** | Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance | | Tim Mather, Subra Kumaraswamy, and Shahed Latif | O'Reilly |
| **3** | Cloud Computing Bible | | Barrie Sosinsky | John Wiley & Sons |

| **MOOCs Links and additional reading, learning, video material** | |
|---|---|
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs14/preview |
| **2** | https://www.simplilearn.com/ |

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

*(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)*

**(Accredited 'A' Grade by NAAC with a score of 3.25)**

Hingna Road, Wanadongri, Nagpur - 441 110

# Bachelor of Technology

# SoE & Syllabus 2021

# 6th Semester

**(Department of Computer Science & Engineering**

## Computer Sciences & Engineering

28 June 2019

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. CSE-202.1

## B.TECH SCHEME OF EXAMINATION 2020-21

(Scheme of Examination w.e.f. 2022-23 onward)

## Computer Science & Engineering

| SN | Sem | Type | Course Code | Course Name | T/P | Contact Hours | | | | Credits | % Weightage | | | ESE Duration Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | T | P | Hrs | | MSEs* | TA** | ESE | |
| **Sixth Semester** | | | | | | | | | | | | | | |
| 1 | 6 | HS | GE2311 | Fundamentals of Management | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 6 | PC | CSE2351 | Computer Networks | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 3 | 6 | PC | CSE2352 | Lab: Computer Networks | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 4 | 6 | PC | CSE2353 | Compilers | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 5 | 6 | PC | CSE2354 | Lab: Compilers | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 6 | 6 | PC | CSE2355 | Software Engineering | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 7 | 6 | PC | CSE2356 | Lab: Software Engineering | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 8 | 6 | PE | | Professional Elective-II | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 9 | 6 | PE | | Lab: Professional Elective-II | **P** | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 10 | 6 | OE | | Open Elective - III ** | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 11 | 6 | OE | | Open Elective - IV ** | **T** | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| | | | | **TOTAL** | | **21** | **0** | **8** | **29** | **25** | | | | |

**Professional Electives -II**

| | | | | |
|---|---|---|---|---|
| 1 | 6 | PE-II | CSE2361 | PE II: Digital Image Processing |
| | 6 | PE-II | CSE2362 | PE II: Lab:Digital Image Processing |
| 2 | 6 | PE-II | CSE2363 | PE II: Internet of Things |
| | 6 | PE-II | CSE2364 | PE II: Lab: Internet of Things |
| 3 | 6 | PE-II | CSE2365 | PE II: Neural Network and applications |
| | 6 | PE-II | CSE2366 | PE II: Lab Neural Network and applications |

**Open Electives -III**

| | | | | |
|---|---|---|---|---|
| 1 | 6 | OE-III | CSE2371 | OE III: Database System Essentials |
| 2 | 6 | OE-III | CSE2372 | OE III: Introduction to Image Processing |
| 3 | 6 | OE-III | CSE2373 | OE III: Programming with Python |

**Open Electives -IV**

| | | | | |
|---|---|---|---|---|
| 1 | 6 | OE-IV | CSE2381 | OE IV: Software Testing for Beginners |
| 2 | 6 | OE-IV | CSE2382 | OE IV: Introduction to Cloud Computing |
| 3 | 6 | OE-IV | CSE2383 | OE IV: Introduction to Web Technology |

| **Audit Courses** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6 | HS | AU2130 | YCCE Communication Aptitude Preparation (YCAP6.3) for CT, IT, CSE | **A** | 3 | 0 | 0 | 3 | 0 | |

**MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment**

**TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance**

**TA** = for Practical : MSPA will be 15 marks each**

| | | | |
|---|---|---|---|
| | | June 2022 | 1.01 |
| **Chairperson** | **Dean (Acad. Matters)** | **Date of Release** | **Version** |

**Applicable for AY 2022-23 Onwards**

## VI Semester
## GE2311 - Fundamentals of Management

| Objective | Outcome |
|---|---|
| 1. To introduce the fundamentals and legal provision of Management<br>2. To introduce the Human Resource and Financial practice of organization<br>3. To Introduce the Project Management<br>4. To provide knowledge of Marketing Activities of Management | Upon successful completion of the course, the student will be able to:<br>1. Explain the Legal provision and Functions of Management.<br>2. Analyze the role of Human Resource and Financial Management in the organization.<br>3. Analyze the project life cycles.<br>4. Identify tools and techniques for the marketing of goods and services. |

| Unit No. | Contents | Max Hrs. |
|---|---|---|
| 1 | **Evolution of Management Thought**: Scientific and Administrative Theory of Management Definition and Concept of Management, Functions of Management: Planning, Organizing, Directing, Coordinating and Controlling, Motivational Theories, Concept of Leadership | 6 |
| 2 | **Legal Aspects of Management:** The Indian Contract Act, 1872 – Formation of Valid Contract, Discharge of Contract, Quasi Contract, Indemnity and Guarantee. The Indian Partnership Act, 1932- Essentials of Partnership, The Companies Act – Nature and Definition of Company, Registration and Incorporation, Memorandum and Article of Association, Kinds of companies, Winding up of the Company | 6 |
| 3 | **Human Resource Management**: Meaning and Scope, Principles of HRD, Job Analysis – Job Description and Job Specification, Job Enrichment, Job Rotation, Training and Development – Purpose and Methods, Performance Appraisal- Purpose, Procedure and Techniques, Grievance Redressal Procedure. | 7 |
| 4 | **Project Management:** Concept, Classification and Characteristics of Project, Project Life Cycle, Project Proposal, Tools and Techniques of Project Management, Network techniques - Introduction and Use of CPM & PERT for planning, SWOT Analysis, Project Risk Analysis, Project Control. | 7 |
| 5 | **Marketing Management**: Definition & scope, Selling & Modern Concepts of Marketing, Market Research, Customer Behaviors, Product Launching, Sales Promotion, Pricing, Channels of Distribution, Advertising, Market Segmentation, Marketing Mix, Positioning, Targeting | 6 |
| 6 | **Financial Management :**Definition & Functions of Finance department, Sources of finance, Types of capital, Profit maximization vs. Wealth Maximization, Functions of Finance Manager in Modern Age, Concept of Risk and Return , Break Even Analysis, Budgets & Budgetary Control, Make or Buy Analysis, Introduction to financial statement – profit and loss A/c and Balance Sheet | 6 |

**Text and Reference Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Principles of Management | | Harold Koontz Ramchandra | Tata McGrow hills |
| 2 | Marketing Management: Planning, Implementation and Control | 3rd Edition | Ramaswamy V.S. and Namakumari S | macmillan publishers |
| 3 | Bare Acts – Indian Contract Act, Indian Partnership Act and Company Law | | | |

| | | | | |
|---|---|---|---|---|
| 4 | Human Resource Management - Text and Cases | 3rd Edition | Dr. V.S.P.Rao | Excel Books |
| 5 | A Text book of Human Resource Management | latest | C.B.Mamoria and S.V.Gankar | Himalaya Publishing House |
| 6 | Project Management Handbook | 1st Edition | Lock, Gower | Routledge |
| 7 | Marketing Management | latest | Rajan Saxena | Tata McGraw Hill |
| 8 | Foundations of Financial Markets and Institutions | 3rd Edition | Fabozzi | Prentice hall |
| 9 | Fundamentals of Financial Instruments | latest | Parameswaran | Wiley India |
| 10 | Financial Institutions and Markets | 3rd Edition | Bhole L M | Tata McGraw-Hill |
| 11 | Financial Services | latest | Khan M Y | Tata Mc Graw Hill |

## VI Semester
## CSE2351 – Computer Networks

| Objective | Course Outcome |
|---|---|
| 1. Understand the importance of layering architecture and cla different types of networks.<br>2. Study of different protocols at various layers.<br>3. Study of modern networking tools. | 1. Identify appropriate design issues and explain network reference model.<br>2. Select appropriate protocol at various layers for the given application.<br>3. Solve problems in the networking domain.<br>4. Analyze the performance of network using different tools<br>5. Design computer networks and sub-networks |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | Introduction to computer networks and Internet, The uses of computer networks, LAN's, MAN's, WAN's, Heterogeneous Networks Network Topologies, Physical Mediums, Concept of Network Protocols, design issues for layers. Layered Architecture: The OSI reference model. TCP/IP reference model, Comparison of OSI & TCP/IP reference models, Various Losses in the Internet, Brief History of Computer Network. | 5 |
| 2 | Application Layer: Basics of Socket Programming, Transport Layer Programming Interface(TCP, UDP) , Protocols: HTTP (Overview, Persistent and Non-Persistent, Message Format, Cookies, Cachess) , SMTP (Overview, Message Formats) , IMAP, POP, DNS; FTP; Telnet, SSH; Peer-to-Peer Applications, BitTorrent Protocol; Conte Distribution Networks; | 7 |
| 3 | Transport Layer: Relationship Between Transport and Network Layer, TCP and UDP; Multiplexing and Demultiplexing; Principles of Reliable Data Transfer; Go-Back-N and Selective Repeat; TCP: Segment Structure, Round Trip Time Estimation, Reliable Data Transfer, State Transitions, Flow Control, Congestion Control, UDP: Segment Structure | 7 |
| 4 | Network Layer, Subnets: Concept of IP Address, Netmask, Subnet; CIDR; Design of a LAN and WAN,r, Routers, Functions of a Router; Switching; Queueing: Causes, Delays; IPV4: Datagram Format, Fragmentation; Network Address Translation; IPv6 Introduction; Multicasting, , Routing algorithms: Link State, Distance Vector Routing; OSPF, BGP, RIP; Routing Policies | 7 |
| 5 | Link Layer: Review of fundamentals of link layer protocols; Error-Detection and -Correction Techniques Ethernet Switches, LANs, LinkLayer Switches, VLANs, Complete tracking of traversal of a packet over internet between two application, MAC | 5 |
| 6 | Transmission Impairments, Transmission Media: Guided, unguided, Architecture of the Internet, Wireless LANs: IEEE 802.11, IEEE 802., The Public Switched Telephone Network, Switching: circuit, packet and message switching, Modems.. | 5 |

| Text Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Computer Networking: A Top-Down Approach | Latest Edition/6th | Kurose and Ross | Pearson Publication |
| 2 | Computer Networks | Latest Edition | Behrouz A. Forouzan | McGraw-Hill Publication |
| 3 | Computer Networks | Latest Edition | A.S. Tanenbaum | Pearson Publication |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Computer Networks A Systems Approach | ISBN: 9780123850591 | Larry Peterson Bruce Davie | Elsevier |
| 2 | Data and computer Communication | ISBN-81- 297-0206-1 | William Stallings | Pearson Education |

## VI Semester
## CSE2352 – Lab. Computer Networks

| Sr. No. | List of Experiment |
|---|---|
| 1 | Study of Network Devices and Network cables. |
| 2 | Implement Network Utility Commands to observe the network details. |
| 3 | Configure TCP/IP to configure Internet on your computer. |
| 4 | Configure network using Cisco Packet Tracer software and show packet transmission from source to destination. |
| 5 | Configure network using Static routing protocol in Cisco Packet Tracer |
| 6 | Use traffic monitoring tool Wire shark to observe network traffic with packet details. |
| 7 | To implement Routing algorithm using Cisco Packet Tracer |
| 8 | Use TCP dump utility to capture and analyse network traffic |
| 9 | To implement Hamming Code using C and C++. |
| 10 | Advanced Practical: Study of NSG tool. |

## VI Semester
## CSE2353 – Compilers

| Objective | Course Outcome |
|---|---|
| 1. To study the structure of Compiler and FLEX tool for generating lexical analyzer<br>2. To explore top down, Bottom up parsing approaches and YACC tool for generating syntax analyzer<br>3. To understand Syntax Directed Translation Scheme.<br>4. To introduce Symbol Table Management and Error Detection and Recovery with respect to all phases of compilation.<br>5. To understand Code optimization and Code generation techniques. | Upon successful completion of the course, the student will be able to:<br>1. Understand basic concepts of compiler design, Lexical analysis process and apply the knowledge of LEX/Flex tool.<br>2. Explain the role of a syntax analyzer and distinguish between different types of parsers, design and implement a parser using a YACC tool.<br>3. Apply the knowledge of Syntax directed translation to create intermediate code generation<br>4. Demonstrate the use of a symbol table throughout compilation.<br>5. Apply various code optimizing transformations and code generation techniques. |

| Unit No. | Contents | Max Hrs. |
|---|---|---|
| 1 | Introduction to Compilation Process, Compilers & Translators, Phase structure of Compiler, Design of Lexical Analysis. | 6 |
| 2 | Specifying Syntactic Structure of Programming Language using Context Free Grammars, The role of Parser, Top-down Parsing, Bottom Up Parsing, Predictive Parsers, Recursive Decent Parser. | 7 |
| 3 | Construction of efficient LR Parsers (SLR, CLR & LALR), Canonical Collection of set of items and construction of Parsing table, Implementation of LR Parsing table. | 7 |
| 4 | Syntax Directed Translation: Intermediate Code, Postfix notation, Parse tree and Syntax Trees, Three address codes, quadruples, triples, Translation of Arithmetic Expression, Boolean expressions, Control Statements. Array references, Procedure Calls, Declarations, Case Statements, Use of Compiler writing tools (Lex/ Flex, Yacc / Biason). | 7 |
| 5 | Symbol Tables: Contents, Representing scope information. Error detection and Recovery: Error handling, Lexical-phase, Syntactic phase and semantic phase. | 6 |
| 6 | Introduction to Code Optimization, The principle sources of optimization, Loop optimization, The DAG representation, Introductory Data Flow analysis, Introduction to Code Generation: Object programs, Problems in Code Generation, Register allocation and assignment, Code generation from DAG, Peephole optimization. | 7 |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Compilers Principles, Techniques & Tools | 2nd Edition | Alfred V. Aho, Jeffrey D. Ullman & Ravi Sethi | Pearson Education |
| 2 | Principles of Compiler Design | Latest | Alfred V. Aho, Jeffrey D. Ullman | Narosa Publishing House |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Compiler Design | 4th Edition | Dr. O.G. Kakde | Laxmi Publication |
| 2 | Introduction to Compiling Techniques: First Course Using ANSI C, Lex and Yacc | Latest | J. P. Bennett | McGraw-Hill Publication |

## VI Semester
## CSE2354 – Lab.: Compilers

| Sr. No. | List of Experiment |
|---|---|
| 1 | Implement a Lexical Analyzer using FLEX and develop:<br>A. Program For converting all small case letters to UPPER case letters and Vice-Versa.<br>B. Program to count the words, spaces, and lines in a given input file. |
| 2 | Study the LEX/Flex and YACC/Bison tool and Develop:<br>A. LEX program to eliminate comment lines (Single and Multiple) in a text(C program) file and copy the resulting program into a separate file.<br>B. YACC program to recognize valid identifier, operators and keywords in the given text (C program) file. |
| 3 | A. Develop a LEX program to recognize valid arithmetic expression. Identifiers in the expression could be only integers and operators could be + and *. Count the identifiers & operators present and print them separately.<br>B. Develop a YACC program to evaluate arithmetic expression involving operators: +, -, *, and /. |
| 4 | Develop, Implement and execute a program using YACC tool to recognize all strings ending with b preceded by n a's using the grammar a n b (note: input n value), also create DFA of given grammar using JFLAP |
| 5 | Develop a program to find FIRST and FOLLOW of all variables. Write a suitable data structure to store a context fee grammar. Prerequisite is to eliminate left recursion from the grammar before storing |
| 6 | Design and Simulate Predictive / LL (1) Parsing Table using JFLAP for the grammar rules: A→ aBa, B→bB . |
| 7 | Design and Simulate SLR(1) parsing using JFLAP for the grammar rules: E→ E+T \| T, T→ T*F \| F, F → (E) \| id and parse the sentence: id + id * id. |
| 8 | Develop a program for intermediate code generator to generate three address code using LEX & YACC. |

## VI Semester
## CSE2355 – Software Engineering

| Objective | Course Outcome |
|---|---|
| 1. Study software engineering best practices and different strategies applicable for software development, software requirement and its design activity.<br>2. Explore the various testing types and it strategies.<br>3. Understand configuration management, version control and change control process of Software development.<br>4. Understand project management, planning, scheduling, risk management, project and process metrics.<br>5. Get an overview of open source Software Engineering tool viz. Subversion and understand some concepts such as Re-engineering and Reverse engineering. | **Upon successful completion of the course, the student will be able to:**<br><br>1. Choose appropriate software engineering process model, requirement engineering principles and software designing fundamentals for a given project. (CO1)<br>2. Select appropriate testing strategy and apply testing principles for testing a given application. (CO2)<br>3. Apply basics of software configuration management, version control and change control in software development. (CO3)<br>4. Evaluate cost estimation, effort and severity of software risk for given application. (CO4)<br>5. Perform basic operations on Sub-version for software version control. (CO5) |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | Introduction to Software Engineering, A Generic View of process, Process models: Water fall Model, RAD Model, Prototyping Model, Component Development Model, Agile Model, Requirement Engineering: Requirement Engineering Task Initialization Eliciting Requirement, Developing Use Case, Analysis Model, Negotiation, Validation | 6 |
| 2 | Building the Analysis mode: Requirement Analysis, Analysis Modeling Approaches, Data Modeling Concept, Object Oriented Analysis, Types of Modeling, Design Engineering: Design Concept, Design Model. | 7 |
| 3 | Testing Strategies : Strategic Approach, Strategic issues, Strategies for conventional Software, Strategies for Object Oriented Software, Validation Testing, Testing Tactics: White-Box Testing, Basis Path testing: Flow Graph Notation, Independent Program Paths, Control Structure Testing, Black Box Testing, Introduction to object oriented testing. | 7 |
| 4 | Configuration Management: Base lines, Software Configuration items, The SCM Process, Identification of Objects in the Software Configuration, Version Control, Change Control, Configuration Audit, Status Reporting, SCM Standards. | 5 |
| 5 | Project Management, Metrics for Process and Projects, Project Estimation, Risk Management: Reactive vs. Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection. | 7 |
| 6 | Advanced Topics in Software Engineering: Re engineering Computer aided software engineering, Open source SE tools introduction, Example-Subversion: Overview, Typical subversion usage and work flow. | 5 |

| Text Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Software Engineering–A Practitioner's Approach | 6th | Roger S. Pressman | McGraw Hill |
| 2 | Software Engineering, | 9th | Ian Sommerville, | Pearson |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Object Oriented Software Engineering | 6th | Leth Bridge | TATA McGraw Hill |

## VI Semester
## CSE2356 – Lab.: Software Engineering

| Sr. No. | List of Experiment |
|---|---|
| 1 | Introduction to Software Engineering fundamentals, UML and RATIONAL ROSE Interface. |
| 2 | To study and create Software Requirement Specification document for given case study. |
| 3 | To study and draw UML Use Case diagram for the given case study. |
| 4 | To study and draw UML Class diagram for given Case Study. |
| 5 | To study and draw UML Activity diagram for given Case Study. |
| 6 | To study and draw UML Sequence Diagram for given Case Study. |
| 7 | To study and draw State Diagram for given Case Study. |
| 8 | Write a Program to find out the Estimation (cost and effort) by using COCOMO model. |
| 9 | To Perform Manual and Automated testing using CASE tool for given Case Study. |
| 10 | To Study and execute Version Control using Subversion |

## VI Semester

## CSE2361 – PE II: Digital Image Processing

| Objective | Course Outcome |
|---|---|
| 1. Overview the Fundamental concepts of Digital Image Processing<br>2. Explore image enhancement techniques in spatial domain and frequency domain<br>3. Understand the fundamental concept of image compression<br>4. To Study various similarity based, and dissimilarity-based image segmentation approaches.<br>5. Understand the basic concepts of image representation and description. | 1. Describe Basic relationships between pixels.<br>2. Compare various image enhancement techniques in spatial domain and frequency domain.<br>3. Illustrate different image compression techniques to understand the advantage of image compression<br>4. Demonstrate the applications of similarity based and dissimilarity-based approaches for image segmentation.<br>5. Interpret various representation techniques |

| Unit No. | Contents | Max. Hrs. | CO |
|---|---|---|---|
| 1 | **Introduction:** Fundamental Steps in Image Processing, Elements of DIP systems, Elements of Visual Perception, Fundamentals of Image processing, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels. | 5 | CO1 |
| 2 | **Image Enhancement in the Spatial Domain:** Introduction to Spatial and Frequency methods, Basic Gray Level Transformations, Histogram Equalization, Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters. | 6 | CO2 |
| 3 | **Transforms:** Introduction to the Fourier Transform, Discrete Fourier Transformation, Fourier Properties, 2DFT, inverse Fourier transform, **Image Enhancement in the frequency Domain:** Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering. | 7 | CO2 |
| 4 | **Image Compression:** Fundamentals of Image compression, coding redundancy, spatial and temporal redundancy, Measuring Image Information, Fidelity criteria, Image compression models, Basic compression methods, Huffman coding, arithmetic coding, LZW coding, run length coding. | 5 | CO3 |
| 5 | **Image Segmentation**: Point Detection, Line Detection, Edge Detection, Gradient Operator, Edge Linking and Boundary Detection, Thresholding, Region-oriented Segmentation. | 6 | CO4 |
| 6 | **Image Representation:** Chain Codes, Polygonal Approximations, Signatures, Boundary Segments, Skeleton of a Region. Description: Boundary Descriptors, Shape Numbers, Regional Descriptors, Topological Descriptors. Introduction to color image processing: RGB and HSI color models. | 5 | CO5 |

| | | | | |
|---|---|---|---|---|
| **Text books:** | | | | |
| 1 | Digital Image Processing | 3rd edition 2007 | Rafael C. Gonzalez and Richard E. Woods | Prentice Hall |
| 2 | Digital Image Processing | 2009 | S Jayaraman | Tata McGraw Hill |
| **Reference books:** | | | | |
| 1 | Fundamentals of Digital Image Processing | 1988 | A K Jain | Prentice Hall, 1988 |
| 2 | Image Processing Principles & Applications | 2005 | Tinku Acharya & Ajoy K. Ray | Willey Inter-Science |

## VI Semester
## CSE2362 – PE II: Lab: Digital Image Processing

| Sr. No. | List of Experiment |
|---|---|
| 1 | 1. Write a program in MATLAB for following Point processing techniques in spatial domain<br>a. Negation of an image<br>b. Thresholding of an image<br>c. Contrast Stretching of an image |
| 2 | . Write a Program in MATLAB to Create a Histogram of a given Image OR<br>*https://cse19-iiith.vlabs.ac.in/objective.php?exp=histo* |
| 3 | Write a program in MATLAB to perform following smoothing operations on an image<br>a. Average filter<br>b. Ordered Statistics filter |
| 4 | . Write a program in MATLAB to sharp an image using Laplacian mask. |
| 5 | . Write a program in MATLAB to segment an image using multilevel thresholding OR<br>*https://cse19-iiith.vlabs.ac.in/objective.php?exp=segment* |
| 6 | . Write a program in MATLAB to apply split and merge algorithm on a given image. |
| 7 | Write a program in MATLAB to find the code chain of a given image. |
| 8 | Write a program in MATLAB to find Euler number of image a given image. |
| 9 | Write a program using OpenCV tool to detect the object present in an image. |
| 10 | Write a program using OpenCV tool to detect and track the object present in video. |

## VI Semester
## CSE2363 – PE II: Internet of Things

| Objective | Course Outcome |
|---|---|
| 1. Get acquainted with various IOT environments.<br>2. Study IOT architecture and its enabling technologies.<br>3. Acquire hands on laboratory experience, utilizing IOT kit. | 1. Develop various IOT environments<br>2. Demonstrate IOT architecture and its enabling technologies<br>3. Analyze IOT environments using various communication technologies<br>4. Apply various IOT enabling technologies for creation of IOT environments |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Introduction :** Concepts behind the Internet of Things, Characteristics of IoT, IoT enabling technologies, IoT Communication Model, IoT architecture, Applications of IoT, Transducers, Sensors, Sensor classes, Sensor types, Actuators and its types. | 6 |
| 2 | **IOT Protocols**: Application layer: MQTT, COAP, XMPP, AMQP, Network Layer: IPv4, IPv6, 6LoWPAN, IoT Communication protocols: IEEE802.15.4, ZigBee, Wireless HART, Zwave, Bluetooth, NFC, RFID. | 7 |
| 3 | **Wireless Sensor networks**: Components of sensor nodes, Node Behavior in WSNs, Applications, WSN Coverage, OGDC algorithm, Stationary and Mobile Wireless Sensor Networks. | 6 |
| 4 | **Cloud Computing:** Recent Trends in Computing, Characteristics, Components of Cloud Computing, Service Models, Deployment Models, Service Management, Cloud Security, IoT Data analytics, Case studies, Middleware for IoT | 6 |
| 5 | **Machine to Machine Communication**: Node types, IP and Non IP based M2M network Interoperability in Internet of Things: Current Challenges in IoT, Interoperability, Types of Interoperability | 6 |
| 6 | **Software-Defined Networking**: Current Network to SDN, SDN Architecture, Challenges, OpenFlow Protocol, APIs in SDN, Controller Placement, Recent Advances of SDN in IoT, Industrial internet of things, Case studies | 6 |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Internet of Things: A Hands-On Approach | Latest | Arsheep Bahga, Vijay Madisetti | Universities Press |

**Reference Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Introduction to IOT | Latest | S.Misra , A. Mukherjee, A.Roy | Cambridge university press |

## VI Semester
## CSE2364 – PE II: Lab: Internet of Things

| Sr. No. | List of Experiment |
|---|---|
| 1 | To study IoT Kit |
| 2 | Design a sketch for running of LED's |
| 3 | Design a sketch to monitor state of switch by establishing serial communication between Arduino and computer |
| 4 | Design a sketch to read analog value of potentiometer by establishing serial communication between arduino and computer |
| 5 | Design a sketch for blinking LED's without using delay |
| 6 | Design a sketch to develop switch based binary LED counter. Also observe output on serial monitor |
| 7 | Design a sketch to create a simple digital clock using LCD display |
| 8 | Design a sketch to make use of EEPROM to control devices(LED) |
| 9 | To log data of temperature sensor over internet and monitor it from anywhere in the world |
| 10 | Use of ESP-32 |

## VI Semester

## CSE2365 – PE II: Neural Network and Applications

| Course Outcome |
|---|
| Upon successful completion of the course the students will be able to<br>CO 1: understand the basic concepts, underlying mathematics, and differences between Networks<br>CO 2: Apply popular neural network algorithms for solving classification and regression problems<br>CO 3: Identify and Analyse various ways of selecting suitable model parameters for different neural network algorithms.<br>CO 4: Design multi-layer feed-forward neural networks and CNNs using deep learning concepts |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Introduction to Biological and Artificial Neural Networks:** Biological Neurons, General Artificial Neuron Model, MP Neuron, Perceptrons, Neural Network learning Rules, types of neural networks, feedforward vs recurrent neural networks | 6 |
| 2 | **Perceptrons and Machine Learning Basics:** Single Discrete Perceptron algorithm, linear machine and minimum distance classification, gradient descent and Single Continuous Perceptron algorithm<br>Machine learning basics: supervised vs unsupervised learning, various Machine learning tasks like classification, regression, machine Translation, Anomaly detection, etc. Capacity, Overfitting and Underfitting, bias and variance. | 6 |
| 3 | **Multilayer Perceptrons and Backpropagation Algorithm:** Multilayer Perceptrons (MLPs), Representation Power of MLPs, Feed forward Neural Networks, Backpropagation, algorithm, Momentum Based Gradient Descent (GD), Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Applications of MLPs for classification and regression,Performance measures. | 6 |
| 4 | **Regularization:** L1, L2 Regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, any other recent topics. | 5 |
| 5 | **Introduction to Deep Networks:** History of deep learning, Types of deep networks, Introduction to Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Transfer learning using CNNs, comparison of shallow and deep networks. | 6 |
| 6 | **Autoencoders:** Auto encoders, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto encoders. | 5 |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Deep Learning | Latest | Ian Goodfellow, Yoshua Bengio, Aaron Courville | MIT Press |
| 2 | Introduction to artificial neural systems | Latest | Jacek M. Zurada | - |

| | | | | |
|---|---|---|---|---|
| | | Jan 2021 | 1.00 | Applicable for AY 2021-22 Onwards |
| Chairperson | Dean (Acad. Matters) | Date of Release | Version | |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Deep learning with python | Latest | Francois Chollet | Manning |
| 2 | Pattern Recognition and Machine Learning | Latest | Christopher Bishop | Springer |
| 3 | Neural Networks: A Systematic Introduction | Latest | Raul Rojas | Springer |
| 4 | Deep Learning | First | Amit Das, Saptarshi Goswami, Prabir Mitra, Amlan Chakrabarti | Pearson |

| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
|---|---|
| **1** | http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 |
| **2** | https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042 |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | Deep Learning – Prof. Mitesh Khapra (IIT Ropar ), Swayam Course https://onlinecourses.nptel.ac.in/noc22_cs124/preview |
| **2** | Neural Networks and Deep Learning, Andrew Ng https://www.coursera.org/learn/neural-networks-deep-learning#syllabus |

## VI Semester

## CSE2366 – PE II: LAB: Neural Network and Applications

**Practicals based on above subject**

## VI Semester

## CSE2371 – OE III: Database System Essentials

| Objective | Course Outcome |
|---|---|
| To understand basic database concepts by students whose basic degree is not in Computer or IT. | Upon successful completion of the course the students will be able to<br>1. Understand the basics concepts of Database System and its modelling, compare SQL and NoSQL databases.<br>2. Solve queries based on SQL and procedures using PL-SQL, & Analyse data dependencies & normalization.<br>3. Understand Query Processing and evaluate queries.<br>4. Understand ACID Properties and database system Architecture. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| Unit:1 | **Database System Essentials**: Purpose of Database systems, Example of Database Applications, Basic Terminologies, Data Models, Entity–Relationship Model, Relational Model. | 6 Hours |
| Unit:2 | **Relational Databases:** Introduction, SQL, DDL, DML, DCL, Database Integrity and Security, Relational–Database Design, Object–Oriented Databases, Object–Relational Databases, database constraints, functional dependencies and normalization. | 7 Hours |
| Unit:3 | **Data Storage and Querying:** Storage and File Structure, Indexing and Hashing, Data Retrieval, Query Processing, data-access techniques, query-evaluation. | 6 Hours |
| Unit:4 | **Transaction Management**: Introduction, transaction atomicity, consistency, isolation, and durability, concurrency control, serializability, locking, time stamping. Deadlock issues. | 6 Hours |
| Unit:5 | **Database System Architecture**: Centralized systems, client–server systems, parallel and distributed architectures, and network types, | 6 Hours |
| Unit :6 | **PL-SQL and No SQL:** Introduction to Pl-SQL, Block Structure: Variables, Decision Structures & Loops, Basic Pl-SQL programming.<br>Overview of NoSQL Databases, SQL Vs NO SQL, Types of NoSQL Database | 6 Hours |

| **Text Books** | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | Database System Concepts | 7th Edition | Silberschatz–Korth–Sudarshan | McGraw–Hill, 2019 |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | Fundamentals of Database Systems | 5th Edition | Elmasri, Navathe & Gupta | Pearson Education |
| **2** | Database Systems | 5th Edition | S. K. Singh | Pearson Education |

| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
|---|---|
| 1 | http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 |
| 2 | https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042 |
| **MOOCs Links and additional reading, learning, video material** | |
| 1 | https://onlinecourses.nptel.ac.in/noc21_cs04/preview |
| 2 | https://onlinecourses.nptel.ac.in/noc22_cs80/preview |

## VI Semester

## CSE2372 – OE III: Introduction to Image Processing

| Objective | Course Outcome |
|---|---|
| 1. Overview the Fundamental concepts of Digital Image Processing<br>2. Explore image enhancement techniques in spatial domain and frequency domain<br>3. Understand the fundamental concept of image compression<br>4. To Study various similarity based, and dissimilarity-based image segmentation approaches.<br>5. Understand the basic concepts of image representation and description. | Upon successful completion of the course the students will be able to<br>CO1: Understand basic principles of image processing.<br>CO2: Analyze images using processing algorithms/Techniques.<br>CO3: Apply the concepts to implements basic image processing algorithms/operations. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| Unit:1 | Fundamentals of Image Processing: Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations. | 6 Hours |
| Unit:2 | Image Transformations: Image Enhancement in the Spatial Domain: Basic Grey Level Transformations, Histogram Processing, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters. | 7 Hours |
| Unit:3 | Image Processing: Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation | 6 Hours |
| Unit:4 | Image Segmentation :Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds | 6 Hours |
| Unit:5 | Image Compression: Image Compression: Fundamentals, Some Basic Compression Methods - Run Length Coding, Huffman Coding, Arithmetic Coding, Bit Plane Coding, Block Truncation Coding. JPEG Compression. | 6 Hours |
| Unit :6 | Morphological Image Processing: Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, Hit or Miss Transformation, Some Basic Morphological Algorithms, Grey Scale Morphology. | 6 Hours |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Digital Image Processing, (DIP/3e) | 3rd edition | Gonzalez and Woods | Prentice Hall - 2008 |

| Reference Books | | | | |
|---|---|---|---|---|
| **SN** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Digital Image Processing | latest | Kenneth R Castleman | Pearson Education |
| 2 | Fundamentals of Digital image Processing | latest | Anil Jain.K | Prentice Hall of India |

| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
|---|---|
| 1 | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/ |
| **MOOCs Links and additional reading, learning, video material** | |
| 1 | https://onlinecourses.nptel.ac.in/noc21_cs04/preview |
| 2 | https://onlinecourses.nptel.ac.in/noc22_cs80/preview |

## VI Semester

## CSE2373 – OE III: Programming with Python

| Course Outcome |
|---|
| Upon successful completion of the course the students will be able to :<br>1. Understand the basic data types, built in data structures, control statements and loops and write simple programs in Python.<br>2. Apply the concepts of functions modules and packages and write programs using them.<br>3. Design and develop classes in Python.<br>4. Solve real world problems and develop interesting applications using Python. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| Unit:1 | **Introduction to Python**: Build-in Data types & variables, arithmetic operators, assignment statement, print & input function, relational and logical operators, if, if – else & nested if- else statements, writing simple programs. | 7 Hours |
| Unit:2 | **Data Structures:** Built in data structures: Lists, Dictionaries, Tuples, Sets, and Arrays. Programs based on the built in data structures | 6 Hours |
| Unit:3 | **Looping: Loop statements:** For, while, continue and break statements, list comprehension. Bitwise operators, Real world problem solving based on loops. | 6 Hours |
| Unit:4 | **Functions:** Library functions in Python standard library, user defined Functions, returning values, local & global variables , global statement, doc strings for functions, developing useful functions, Modules and Packages, import statement. | 6 Hours |
| Unit:5 | **Introduction to Object oriented programming in Python:** Features of object oriented programming, Python Object and Classes: defining classes, member variables, doc strings for classes, Private members, Operator Overloading, inheritance and polymorphism. | 7 Hours |
| Unit :6 | **Application Development:** Developing applications using libraries and packages, File handling, Exception handling, developing applications using Python | 5 Hours |

**Text Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Learn Python Programming | Third Edition | Fabrizio Romano, Heinrich Kruger | PACKT Publishing |

**Reference Books**

| SN | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | Introduction to Computation and Programming Using Python | Second Edition | John V. Guttag | PHI EEE (MIT Press) |

| MOOCs Links and additional reading, learning, video material | |
|---|---|
| 1 | https://onlinecourses.nptel.ac.in/noc20_cs70/preview |
| 2 | https://onlinecourses.nptel.ac.in/noc20_cs83/preview |

## VI Semester

## CSE2381 – OE IV: Software Testing for Beginners

| Objective | Course Outcome |
|---|---|
| 1. Understand Software testing fundamentals / principles.<br>2. Learn systematic approach to software testing using strategies.<br>3. Explore Methods and tools of testing software. | Upon successful completion of this course, the student will be able to:<br>1. Formulate problem by following Software testing life cycle.<br>2. Design Manual Test cases for Software Project.<br>3. Demonstrate utilization of testing automation though testing tool. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| 1 | **Software Testing Basics:** Basic concepts of Testing: Need of Testing, Basic concepts-errors, faults, defects, failures, objective of testing, central issue in testing, Testing activities, V-Model, Sources of information for test cases, Monitoring and Measuring Test Execution, Test tools and Automation, Limitation of Testing. | 6 |
| 2 | **Unit Testing:** Unit Testing: Concepts of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging, Tools for Unit Testing. | 6 |
| 3 | **Control Flow Testing:** Control Flow Testing: Outline of Control Flow Testing, Control Flow Graphs, Path in Control Flow Graph, Path selection criteria, All path coverage criteria, Statement coverage, Path coverage. | 7 |
| 4 | **Integration Testing:** Data Flow and System Integration Testing: Introduction Data flow testing, Data flow graph, Data flow testing criteria, Fundamentals of System Integration: Types of interfaces and interface errors, System integration testing, Software and Hardware integration. | 7 |
| 5 | **System Testing:** System Testing: Taxonomy of system test, Basic Test, Functionality test, Robustness test, Performance test, Scalability test, Stress test, Load and Stability test, Reliability test, Regression test, Documentation Test. | 6 |
| 6 | **Test Cases:** Test Design: Test cases, Necessity of test case documentation, Test case design methods, Functional specification-based test case design, Use case bases, application based test case design, level of test execution. | 6 |

| Text Books | | | | |
|---|---|---|---|---|
| **S.No** | **Title** | **Edition** | **Authors** | **Publisher** |
| 1 | Software Testing and Quality Assurance | | Kshirsagar Naik and PriyadarshiniTripathi | Wiley Publication |
| 2 | Software Testing Principles, Techniques and Tools | | M.G. Limaye | McGraw Hills |

| Reference Books | | | | |
|---|---|---|---|---|
| **S.No** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | Foundations of Software Testing | | Aditya P. Mathur | Pearson Education |
| **2** | Software Testing Tools | | Dr. K. V. K. K. Prasad | Dream Tech |

| MOOCs Links and additional reading, learning, video material | |
|---|---|
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs13/preview |
| **2** | https://onlinecourses.nptel.ac.in/noc19_cs71/preview |

## VI Semester

## CSE2382 – OE IV: Introduction to Cloud Computing

| Course Outcomes: |
|---|
| Upon successful completion of the course the students will be able to<br>1. Understand Cloud Computing Models.<br>2. Apply Cloud Concepts &Technologies.<br>3. Analyse Cloud Services & Platforms<br>4. Use MapReduce to process Big Data on Apache Hadoop. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| Unit:1 | **Introduction to Cloud Computing:** Definition of Cloud Computing, Characteristics of Cloud Computing, Cloud Models (Service & Deployment), Cloud Services Examples (IaaS, PaaS, SaaS), Cloud-based Services and Applications (Cloud computing for Healthcare, Manufacturing Industry and Education). | 6 Hours |
| Unit:2 | **Cloud Concepts &Technologies:** Virtualization, Load balancing, Scalability & Elasticity, Monitoring, Identity & Access Management, Service Level Agreements | 6 Hours |
| Unit:3 | **Cloud Services & Platforms:** Compute Services (Amazon Elastic Compute Cloud, Google Compute Engine, Windows Azure Virtual Machines), Storage Services (Amazon Simple Storage services, Google Cloud Storage, Windows Azure Storage), Database Services (Amazon Relational Data Store, Google Cloud SQL, Windows Azure SQL Database), Application Services (Application Runtimes & Frameworks) Identity & Access Management Services ( Amazon Identity & Access Management, Windows Azure Active Directory), Open Source Private Cloud Software ( CloudStack, Eucalyptus, OpenStack). | 6 Hours |
| Unit:4 | **Hadoop & MapReduce:** Apache Hadoop, Hadoop MapReduce Job Execution, NameNode, Secondary NameNode, JobTracker, TaskTracker, DataNode, MapReduce Job Execution Workflow, Hadoop Schedulers, Hadoop Cluster Setup. | 6 Hours |
| Unit:5 | **Cloud Application Design:** Design Considerations for Cloud Applications, Scalability, Reliability & Availability, Security, IaaS, SaaS Services for Cloud Applications. | 6 Hours |
| Unit :6 | **Cloud Security:** Introduction, CSA Cloud Security Architecture, Authentication, Single Sign On (SSO), Authorization. | 6 Hours |

| **Text Books** | | | | |
|---|---|---|---|---|
| **S.No** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | CLOUD COMPUTING A Hands -on Approach | Latest | Arshdeep Bahga & Vijay Madisetti | Wiley Publication |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **S.No** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | CLOUD COMPUTING | **18th edition** | Michael Miller | PEARSON PUBLICATION |
| **2** | Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance | | Tim Mather, Subra Kumaraswamy, and Shahed Latif | O'Reilly |
| **3** | Cloud Computing Bible | Latest | Barrie Sosinsky | John Wiley & Sons |

| **MOOCs Links and additional reading, learning, video material** | |
|---|---|
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs14/preview |
| **2** | https://www.simplilearn.com/ |

## VI Semester
## CSE2383 – OE IV: Introduction to Web Technology

| **Course Outcomes:** |
|---|
| Upon successful completion of the course the students will be able to<br>1. Design Web pages using HTML5<br>2. Build an interactive website with CSS3<br>3. Develop basic programming skills using JavaScript<br>4. Create XML documents and Schemas. |

| Unit No. | Contents | Max. Hrs. |
|---|---|---|
| Unit:1 | **Introduction to internet:** Overview of Internet, Intranet, WWW, Internet Protocols (HTTP, FTP, SMTP), Email, broadband. | 6 Hours |
| Unit:2 | **Introduction to HTML5:** Web server, Web Client/Browser, Structure of an HTML Program, Basic HTML Tags( Headings, Paragraph, Division, Text formatting, Image, Anchors), HTML Lists (Ordered Lists, Unordered Lists, Description Lists), HTML Attributes, HTML Links (Href Attribute, Target Attribute). | 6 Hours |
| Unit:3 | **Table handling in HTML and Creating Forms:** Table handling in HTML: width and border attribute, CELLPADDING attribute, CELLSPACING attribute, COLSPAN and ROWSPAN attributes, background color attribute, HTML Forms: Elements to Capturing Form Data, Properties of Form Elements, HTML Layout Elements(Semantic Elements), HTML style attribute, HTML class and id attribute. | 6 Hours |
| Unit:4 | **Cascading Style Sheets (CSS3):** Introduction to CSS, Differences between CSS3 and earlier CSS specifications, CSS Syntax, CSS selectors, Inserting CSS: Inline, Internal, External, CSS properties: Background, Text, Font, Border, Margin, Padding, List, Dimension, and Classification. | 6 Hours |
| Unit:5 | **Java Script:** Introduction to Java Script, Functions of Javascript, Variables and Data Types, Operators, Loops and control statement: if Statement, if...else Statement, else if Statement, JavaScript Switch Statement, JavaScript Functions, JavaScript Loops: for loop, while loop, do...while loop, Dialog Boxes, JavaScript Events. | 6 Hours |
| Unit :6 | **Introduction to XML:** What is XML?, Features of XML, XML Syntax and Structure Rules(Start tags, End tags, Empty elements, XML tag attributes),XML Document Type Declaration(DTD, Internal DTD's, External DTD's. | 6 Hours |

**Text Books**

| S No | Title | Edition | Authors | Publisher |
|---|---|---|---|---|
| 1 | eb Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX | | | Kogent Learning Solutions Inc. |

| Reference Books | | | | |
|---|---|---|---|---|
| **S No** | **Title** | **Edition** | **Authors** | **Publisher** |
| **1** | HTML & CSS: The Complete Reference | Fifth Edition | Thomas A. Powell | The McGraw-Hill Companies, Inc |
| **2** | Web Technologies | | Ivan Bayross | BPB Publication |

| MOOCs Links and additional reading, learning, video material | |
|---|---|
| 1 | https://nptel.ac.in/courses/106105084 |
| 2 | https://www.youtube.com/watch?v=uUhOEj4z8Fo |
| 3 | https://www.youtube.com/watch?v=mU6anWqZJcc |

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

*(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)* **(Accredited 'A++' Grade by NAAC with a score of 3.6)**

Hingna Road, Wanadongri, Nagpur - 441 110


# Bachelor of Technology

# SoE & Syllabus 2021

# 7th Semester

**(Department of Computer Science & Engineering**

## Computer Sciences & Engineering

28 June 2019

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. CSE-202.1

## B.TECH SCHEME OF EXAMINATION 2020-21

(Scheme of Examination w.e.f. 2022-23 onward)

## Computer Science & Engineering

| SN | Sem | Type | Course Code | Course Name | T/P | Contact Hours | | | | Credits | % Weightage | | | ESE Duration Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | T | P | Hrs | | MSEs* | TA** | ESE | |
| **Seventh Semester** | | | | | | | | | | | | | | |
| 1 | 7 | PC | CSE2401 | Artificial Intelligence | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 2 | 7 | PC | CSE2402 | Lab: Artificial Intelligence | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 3 | 7 | PC | CSE2403 | Cryptography and Network Security | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 4 | 7 | PE | | Professional Elective-III | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 5 | 7 | PE | | Professional Elective-IV | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 6 | 7 | PE | | Lab:Professional Elective-IV | P | 0 | 0 | 2 | 2 | 1 | | 60 | 40 | |
| 7 | 7 | PE | | Professional Elective-V | T | 3 | 0 | 0 | 3 | 3 | 30 | 20 | 50 | 3 Hours |
| 8 | 7 | STR | CSE2409 | Mini Project | P | 0 | 0 | 4 | 4 | 2 | | 100 | | |
| 9 | 7 | STR | CSE2410 | CRT | P | 0 | 0 | 0 | 0 | 2 | | 100 | | |
| | | | | | **TOTAL** | **15** | **0** | **8** | **23** | **21** | | | | |

**Professional Electives -III**

| | | | | |
|---|---|---|---|---|
| 1 | 7 | PE-III | CSE2411 | PE III:Software Project Management |
| 2 | 7 | PE-III | CSE2412 | PE III: Adhoc Wireless Network |
| 3 | 7 | PE-III | CSE2413 | PE III: Information Retrival System |
| 4 | 7 | PE-III | CSE2414 | PE III: Natural Language Processing |
| 5 | 7 | PE-III | CSE2415 | PE III: Blockchain Technology |

**Professional Electives -IV**

| | | | | |
|---|---|---|---|---|
| 1 | 7 | PE-IV | CSE2421 | PE IV: Cyber Forensic |
| | 7 | PE-IV | CSE2422 | PE IV: Lab: Cyber Forensic |
| 2 | 7 | PE-IV | CSE2423 | PE IV: Machine Learning Techniques |
| | 7 | PE-IV | CSE2424 | PE IV: Lab: Machine Learning Techniques |
| 3 | 7 | PE-IV | CSE2425 | PE IV: Parallel Programming |
| | 7 | PE-IV | CSE2426 | PE IV: Lab Parallel Programming |
| 4 | 7 | PE-IV | CSE2427 | PE IV : Data Mining & Data Warehousing |
| | 7 | PE-IV | CSE2428 | PE IV : Lab. Data Mining & Data Warehousing |
| 5 | 7 | PE-IV | CSE2429 | PE IV : Java FullStack |
| | 7 | PE-IV | CSE2430 | PE IV : Lab. Java FullStack |
| 6 | 7 | PE-IV | CSE2431 | PE IV : Dot Net FullStack |
| | 7 | PE-IV | CSE2432 | PE IV : Lab. Dot Net FullStack |

**Professional Electives -V**

| | | | | |
|---|---|---|---|---|
| 1 | 7 | PE-V | CSE2441 | PE V: Cloud Computing |
| 2 | 7 | PE-V | CSE2442 | PE V: Distributed System |
| 3 | 7 | PE-V | CSE2443 | PE V: Human Computer Interaction |
| 4 | 7 | PE-V | CSE2444 | PE V: Real Time System |
| 5 | 7 | PE-V | CSE2445 | PE V: Big Data Analytics |

**MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment**

**TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance**

**TA** = for Practical : MSPA will be 15 marks each**

| | | | |
|---|---|---|---|
| | | June 2022 | 1.01 |
| Chairperson | Dean (Acad. Matters) | Date of Release | Version |

Applicable for AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's

# Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No.
CSE-202.1

## B.TECH SCHEME OF EXAMINATION 2020-21

(Scheme of Examination w.e.f. 2022-23 onward)

## Computer Science & Engineering

| SN | Sem | Type | Course Code | Course Name | T/P | Contact Hours | | | | Credits | % Weightage | | | ESE Duration Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | T | P | Hrs | | MSEs* | TA** | ESE | |
| **Eigth Semester** | | | | | | | | | | | | | | |
| 1 | 8 | STR | CSE2451 | Major Project | P | 0 | 0 | 12 | 12 | 9 | | 60 | 40 | |
| 2 | 8 | STR | CSE2452 | Extra Curricular Activity Evaluation | P | 0 | 0 | 0 | 0 | 1 | | 100 | | |
| | | | | **TOTAL** | | **0** | **0** | **12** | **12** | **10** | | | | |
| | | | | **GRAND TOTAL** | | **83** | **0** | **46** | **129** | **160** | | | | |

**MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment**

**TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance**

**TA** = for Practical : MSPA will be 15 marks each**

| | | | | |
|---|---|---|---|---|
| | | **June 2022** | **1.01** | **Applicable for AY 2022-23 Onwards** |
| **Chairperson** | **Dean (Acad. Matters)** | **Date of Release** | **Version** | |

## Semester VII

| CSE2401 | Artificial Intelligence | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. Understand and apply suitable Intelligent agents for various AI applications
2. Build smart system using different informed search / uninformed search or heuristic approaches
3. Solve various constraint satisfaction problem and game playing techniques.
4. Implement ideas underlying modern logical inference systems to solve AI problems.
5. To understand the knowledge representation and under uncertainty.

| Unit:1 | Introduction to AI | 6 Hours |
|---|---|---|

Introduction to Artificial Intelligence, History of Artificial Intelligence, Strong AI Weak AI, Task domain of AI, Intelligent Agents, Agents and Environments, Good Behavior: Concept of Rationality, Nature of Environments, Structure of Agents.

| Unit:2 | Search Techniques | 7 Hours |
|---|---|---|

Solving Problems by Searching, Problem-Solving Agents, Example Problems, Search Algorithms, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions, Search in Complex Environments, Local Search and Optimization Problems.

| Unit:3 | Adversarial Search | 7 Hours |
|---|---|---|

Game Theory, Optimal Decisions in Games, The Mini-Max algorithm, Alpha–Beta Pruning, Partially Observable Games, Limitations of Game Search Algorithms, Constraint Satisfaction Problems (CSP), Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs.

| Unit:4 | Knowledge Representation | 6 Hours |
|---|---|---|

Knowledge Based Agents, Logic, Propositional Logic: Inference, Equivalence, Validity and Satisfiability, Resolution, Forward and Backward Chaining, First Order Logic: Models for first order logic, Symbols and Interpretations, complex sentences, Quantifiers, Inference in FOL, Unification, Forward Chaining, Backward Chaining, Resolution.

| Unit:5 | Planning | 6 Hours |
|---|---|---|

Planning, Language of planning problems, Algorithm for planning as state-space search, Planning graph, Planning and acting in the real world-Time, Schedules and Resources, Hierarchical planning, Planning and

| | | |
|---|---|---|
| acting in Nondeterministic Domains. | | |
| **Unit :6** | **Uncertainty** | **7 Hours** |
| Uncertainty, Handing uncertain knowledge, rational decisions, basics of probability, axioms of probability, inference using full joint distributions, independence, Baye's Rule and conditional independence, Bayesian networks, Semantics of Bayesian networks, Exact inference in Bayesian Networks. | | |
| **Total Lecture Hours** | | **39 Hours** |

| | |
|---|---|
| **Textbooks** | |
| **1** | Artificial Intelligence A Modern Approach, Stuart Russell,Peter Norvig, Pearson |
| **2** | Artificial Intelligence, Third edition, by E. Richand K. Knight and S. Nair, McGraw Hill |
| **Reference Books** | |
| **1** | Introduction to Artificial Intelligence and Expert System, D. W. Patterson, PHI |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 |
| **2** | https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042 |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc21_ge20/preview |
| **2** | https://onlinecourses.nptel.ac.in/noc22_cs67/preview |

## Semester VII

| CSE2402 | LAB – Artificial Intelligence | | L=0 | T=0 | P=2 | CREDITS = 1 |
|---|---|---|---|---|---|---|
| EVALUATION SCHEME | | | | | | |
| MSPA – I | MSPA –II | MSPA – III | MSPA – IV | ESE | TOTAL | ESE DURATION |
| 15 | 15 | 15 | 15 | 40 | 100 | -- |

| Sr. No. | Experiments based on |
|---|---|
| 1 | To implement 8-puzzle problem using uniformed searching technique: Depth First Search |
| 2 | To implement Missionaries and cannibal Problem using uniformed searching technique: Breath First Search |
| 3 | To implement Heuristic (Steepest Ascent) Search for Tic-Tac-Toe game problem. |
| 4 | To implement Min-Max Algorithm for game solving. |
| 5 | To implement Best First Search for Travelling Salesman Problem. |
| 6 | To implement A* Algorithm for Travelling Salesman Problem and compare it with Best First Search. |
| 7 | To implement 8 Queens Problem. |
| 8 | To implement Resolution theorem (Negation). |
| 9 | To implement Naïve Bayes Classifiers. |
| 10 | To implement and demonstrate Bayesian network using pgmpy. |

## Semester VII

| CSE2403 | Cryptography and Network Security | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. Understand the security threats aimed at computer network and describe various security mechanisms and services to counter them.
2. Study cryptographic mathematics to solve network security problems.
3. Study of various cryptographic algorithms
4. Understand different security protocols at various layers of network model

| Unit:1 | Introduction to cryptography | 6 Hours |
|---|---|---|

Introduction: Security goals, cryptographic attacks, Services and mechanism, techniques. Mathematics of cryptography: Integer arithmetic, modular arithmetic, matrices, linear congruence. Mathematics of symmetric key cryptography: Algebraic structure, GF($2^n$) Fields.

| Unit:2 | Ciphers | 6 Hours |
|---|---|---|

Traditional symmetric key ciphers: Introduction, substitution ciphers, Transposition ciphers, stream and block ciphers. Introduction to modern symmetric-key ciphers: Modern block ciphers, modern stream ciphers.

| Unit:3 | Encipherment | 7 Hours |
|---|---|---|

DES, AES, Encipherment using modern symmetric key ciphers: Use of modern block ciphers, use of stream ciphers: RC4. Mathematics of asymmetric key cryptography: Primes, primality testing, factorization, Chinese remainder theorem, Quadratic congruence, Exponentiation and logarithms. Asymmetric key cryptography: RSA, ElGamal, Diffie Helman- key Exchange.

| Unit:4 | Integrity and Authentication | 7 Hours |
|---|---|---|

Message integrity and authentication: Message integrity, Random oracle model, message authentication. Cryptographic hash functions: Introduction, Description of MD hash family, Whirlpool, SHA-512. Digital signature: Comparison, process, services, attacks on digital signature, Digital signature schemes. Entity authentication: Introduction, passwords, Challenge-Response, Zero knowledge, Biometric. Key management: Symmetric key distribution, Kerberos, symmetric key agreement, Public key distribution.

| Unit:5 | Security | 7 Hours |
|---|---|---|

Security at application layer : E-mail, PGP, S/MIME. Security at transport layer: SSL architecture, four protocols, SSL message formats, Transport layer security. Security at network layer IPSec : Two modes, two security protocols, security association, security policy, Internet key exchange, ISAKMP

| Unit :6 | Trusted Systems | 6 Hours |
|---|---|---|
| System security: Description of the system, Users, Trust and trusted systems, Buffer overflow and malicious software, malicious programs, worms, viruses, Intrusion detection systems, Firewalls: Definitions, construction and working principles | | |
| **Total Lecture Hours** | | **39 Hours** |

| **Textbooks** | |
|---|---|
| **1** | Cryptography and Network Security, by Behrouz A.Forouzan, and Debdeep Mukhopadhyay, McGraw-Hill Publication.,2nd Edition. |
| **Reference Books** | |
| **1** | Cryptography and Network Security by Atul Kahate, fourth edition, McGraw-Hill Publication. |
| **2** | Cryptography And Network Security Principles And Practice ,Fifth Edition, WILLIAM STALLINGS |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/39.Guide%20to%20computer%20network%20security.pdf |
| **2** | http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/11.2010_Book_UnderstandingCryptography.pdf |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs16/preview |
| **2** | https://onlinecourses.nptel.ac.in/noc22_cs03/preview |

## Semester VII

| CSE2411 - PE III | Software Project Management | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. To understand basic concepts about project, project management and project planning.
2. To assess given requirements and perform cost benefit analysis.
3. To create a project schedule using some network planning model for given requirements.
4. To identify and create a risk management plan for given requirements.
5. To perform earned value analysis for given requirements and current completion state of project.
6. To form teams for any given exercise, work as a team and understand leadership qualities.

F.net

| Unit:1 | Introduction | 8 Hours |
|---|---|---|

Introduction to Software Project Management: Project Definition, Contract Management, Activities Covered By Software Project Management, Overview of Project Planning, Stepwise Project Planning.

| Unit:2 | Evaluation & Assessment | 7 Hours |
|---|---|---|

Project Evaluation: Strategic Assessment, Technical Assessment, Cost Benefit Analysis, Cash Flow Forecasting, Cost Benefit Evaluation Techniques, Risk Evaluation.

| Unit:3 | Planning | 7 Hours |
|---|---|---|

Activity Planning: Objectives, Project Schedule, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass, Backward Pass, Activity Float, Shortening Project Duration, Activity on Arrow Networks.

| Unit:4 | Risk Management | 6 Hours |
|---|---|---|

Risk Management: Risk Management, Nature Of Risk, Types Of Risk, Managing Risk, Hazard Identification, Hazard Analysis, Risk Planning And Control.

| Unit:5 | Monitoring | 6 Hours |
|---|---|---|

Monitoring and Control: Creating Framework , Collecting The Data , Visualizing Progress, Cost Monitoring, Earned Value, Prioritizing Monitoring, Getting Project Back To Target, Change Control, Managing Contracts, Introduction, Types Of Contract, Stages In Contract Placement, Typical Terms of A Contract, Contract Management, Acceptance.

| Unit :6 | Decision Making | 6 Hours |
|---|---|---|
| Managing People and Organizing Teams: Introduction, Understanding Behavior, Organizational Behaviour: A Background, Selecting The Right Person For The Job, Instruction In The Best Methods , Motivation, The Oldman – Hackman Job Characteristics Model, Working In Groups– Becoming A Team, Decision Making, Leadership, Organizational Structures, Stress, Health And Safety. | | |
| **Total Lecture Hours** | | **38 Hours** |

| | |
|---|---|
| **Textbooks** | |
| **1** | Software Project Management, Third Edition, Bob Hughes, Mikecotterell, Tata McGraw Hill. |
| **2** | Software Project Management, Royce, Pearson Education |
| **Reference Books** | |
| **1** | Software Project Manangement in Practive, Jalote, Pearson Education |
| **2** | Managing Global Projects, Ramesh, Gopalaswamy, Tata McGraw Hill. |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/ |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc22_cs107/preview |
| **2** | https://nptel.ac.in/courses/112102106 |

## Semester VII

| CSE2412 - PE III | Adhoc Wireless Network | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. Identify the characteristics and features of Adhoc Networks.
2. Understand the concepts & be able to design MAC protocols for Ad Hoc networks
3. Implement protocols / Carry out simulation of routing protocols of Adhoc Networks
4. Interpret the flow control in transport layer of Ad Hoc Networks
5. Analyze security principles for routing of Ad Hoc Networks

| Unit:1 | Introduction | 7 Hours |
|---|---|---|

INTRODUCTION: Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models: indoor and outdoor models.

| Unit:2 | MAC Protocols | 7 Hours |
|---|---|---|

MAC Protocols: Design issues, goals and classification. Contention based protocols – with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

| Unit:3 | Routing | 7 Hours |
|---|---|---|

Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.

| Unit:4 | Transport Layer | 6 Hours |
|---|---|---|

Transport Layer: Issues in designing – Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

| Unit:5 | Cross layer Design | 6 Hours |
|---|---|---|

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of adhoc with Mobile IP networks.

| Unit :6 | Security | 6 Hours |
|---|---|---|

Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in

| | |
|---|---|
| security provisioning, Leadership. | |
| **Total Lecture Hours** | **39 Hours** |
| **Textbooks** | |
| **1** | Ad Hoc Wireless Networks: Architectures and Protocols, 2004, C. Siva Ram Murthy and B. S. Manoj, Prentice Hall |
| **2** | Ad hoc Networking, 2000, Charles E. Perkins, Addison – Wesley. |
| **Reference Books** | |
| **1** | Protocols and Architectures for Wireless Sensor Networks, H. Karl and A. Willig. John, Wiley & Sons |
| **2** | Wireless Sensor Networks: Technology, Protocols, and Applications, K. Sohraby, D. Minoli, and T. Znati. John, Wiley & Sons |
| **3** | Wireless Sensor Networks, C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Springer Verlag |
| **4** | Wireless Sensor Networks: Architectures and Protocols, E. H. Callaway, Jr. AUERBACH |
| **5** | Networking Wireless Sensors, B. Krishnamachari, Cambridge University Press |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 |
| **2** | https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042 |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://archive.nptel.ac.in/courses/106/105/106105160/ |
| **2** | https://onlinecourses-archive.nptel.ac.in/noc18_cs09/preview |

## Semester VII

| CSE2413 - PE III | Information Retrieval System | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. Understand different Information retrieval models.
2. Know about evaluation methods of the information retrieval model.
3. 3. Know the challenges associated with each topic

| Unit:1 | Introduction to Information retrieval | 7 Hours |
|---|---|---|

Introduction to Information retrieval: Information retrieval process, Indexing, Information retrieval model, Boolean retrieval model Dictionary and Postings: Tokenization, Stop words, Stemming, Inverted, index, Skip pointers, Phrase queries

| Unit:2 | Tolerant Retrieval | 7 Hours |
|---|---|---|

**Tolerant Retrieval** : Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex

**Term Weighting and Vector Space Model:** Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex.

| Unit:3 | Evaluation | 7 Hours |
|---|---|---|

**Evaluation**: Precision, Recall, F-measure, E-measure, Normalized recall, Evaluation problems

**Latent Semantic Indexing**: Eigen vectors, Singular value decomposition, Low rank approximation, Problems with Lexical Semantics.

| Unit:4 | Query Expansion | 6 Hours |
|---|---|---|

**Query Expansion** : Relevance feedback, Rocchio algorithm, Probabilistic relevance feedback, Query Expansion and its types, Query drift

**Probabilistic Information Retrieval**: Probabilistic relevance feedback, Probability ranking principle, Binary Independence Model, Bayesian network for text retrieval

| Unit:5 | XML Indexing and Search | 6 Hours |
|---|---|---|

**XML Indexing and Search**: Data vs. Text-centric XML, Text-Centric XML retrieval, Structural terms.

| Unit :6 | Web Information Retrieval | 6 Hours |
|---|---|---|

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| **Web Information Retrieval**<br>Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS. | |
| **Total Lecture Hours** | **39 Hours** |
| **Textbooks** | |
| **1** | Introduction to Information Retrieval , Christopher D. Manning, Raghavan and Schutze, Cambridge University Press,2008 |
| | |
| **Reference Books** | |
| **1** | Natural Language Processing And Information Retrieval, Tanveer Siddiqui and U. S. Tiwary, Oxford Higher Education,2008 |
| | |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 |
| **2** | https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042 |
| | |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://cse.iitkgp.ac.in/~pabitra/course/ir06/ir06.html |
| **2** | https://cse.iitk.ac.in/pages/CS657.html |

## Semester VII

| CSE2414 - PE III | Natural Language Processing | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. Model linguistic phenomena with formal grammars.
2. Design, implement and test algorithms for NLP problems
3. Apply NLP techniques to design real world NLP applications

| Unit:1 | Introduction to NLP | 5 Hours |
|---|---|---|

Introduction, History of NLP, Generic NLP system, levels of NLP , Knowledge in language processing , Ambiguity in Natural language, stages in NLP, challenges of NLP, Applications of NLP.

| Unit:2 | Morphology | 7 Hours |
|---|---|---|

Morphology fundamentals, Morphological Diversity of Indian Languages, Morphology Paradigms, Shallow Parsing, Named Entities, Maximum Entropy Models, Random Fields. Word Level Analysis, Morphology analysis –survey of English and Indian language Morphology, Inflectional morphology & Derivational morphology, Lemmatization, Regular expression, finite automata, finite state transducers (FST) ,Morphological parsing with FST , Lexicon free FST Porter stemmer. N –Grams- N-gram language model, N-gram for spelling correction.

| Unit:3 | Parsing | 7 Hours |
|---|---|---|

Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents, Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution.

| Unit:4 | Semantic & Lexical Analysis | 7 Hours |
|---|---|---|

**Meaning** : Lexical Knowledge Networks, Wordnet Theory, Indian Language Wordnets and Multilingual Dictionaries, Semantic Roles, Word Sense Disambiguation, WSD and Multilinguality
Semantic Analysis: Lexical Semantics, Attachment for fragment of English- sentences, noun phrases, Verb phrases, prepositional phrases, Relations among lexemes & their senses –Homonymy, Polysemy, Synonymy, Hyponymy, Robust Word Sense Disambiguation (WSD), Dictionary based approach.

| Unit:5 | Pragmatics Discourse | 7 Hours |
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Pragmatics Discourse, Co-references, reference resolution, reference phenomenon, syntactic & semantic

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| constraints on co reference. | | |
| **Unit :6** | **NLP Applications** | **7 Hours** |
| Natural language Processing applications (preferably for Indian regional languages) : Sentiment Analysis, Text Entailment, Robust and Scalable Machine Translation, Question Answering in Multilingual Setting, Cross Lingual Information Retrieval (CLIR). | | |
| **Total Lecture Hours** | | **40 Hours** |

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| **Textbooks** | |
| **1** | Jurafsky, Daniel, and James H. Martin, Speech and Language Processing:An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics, PrenticeHall, 2000. |
| **2** | Christopher D. Manning and Hinrich Schütze, Foundations of Statistical Natural Language Processing. Cambridge, MIT Press, 1999. |
| **Reference Books** | |
| **1** | James Allen, Natural Language Understanding, Benjamin/Cummings, 2ed, 1995. |
| **2** | Eugene Charniak, Statistical Language Learning, MIT Press, 1996. |
| **3** | Martin Atkinson, David Britain, Harald Clahsen, Andrew Redford, Linguistics, Cambridge University Press, 1999. |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/54.NLP_Language_processing_jurafsky_BOOK.pdf |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://nptel.ac.in/courses/106101007 |
| **2** | https://onlinecourses.nptel.ac.in/noc22_cs98/preview |

## Semester VII

| CSE2415- PE III | PE III: Blockchain Technology | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. Conceptual understanding of how blockchain technology can be used to innovate and improve business processes.
2. Apply cryptographic hash required for blockchain.
3. Apply the concepts of smart contracts for an application.
4. Design a public blockchain using Ethereum.
5. Design a private blockchain using Hyperledger.
6. Use different types of tools for blockchain applications.

| Unit:1 | Introduction to Block chain | 6 Hours |
|---|---|---|

What is a blockchain, Origin of blockchain (cryptographically secure hash functions), Foundation of blockchain: Merkle trees , Components of blockchain, Block in blockchain, Types: Public, Private, and Consortium, Consensus Protocol, Limitations and Challenges of blockchain

| Unit:2 | Cryptocurrency & Bitcoin blockchain | 7 Hours |
|---|---|---|

**Cryptocurrency:** Cryptocurrency: Bitcoin, Altcoin, and Tokens (Utility and Security), Cryptocurrency wallets: Hot and cold wallets, Cryptocurrency usage, Transactions in Blockchain, UTXO and double spending problem.

**Bitcoin blockchain:** Consensus in Bitcoin, Proof-of-Work (PoW), Proof-of-Burn (PoB), Proof-of-Stake (PoS), and Proof-of-Elapsed Time (PoET), Life of a miner, Mining difficulty, Mining pool and its methods

| Unit:3 | Programming for Blockchain & Introduction to Programming | 6 Hours |
|---|---|---|

**Programming for Blockchain:** Introduction to Smart Contracts, Types of Smart Contracts, Structure of a Smart Contract, Smart Contract Approaches, Limitations of Smart Contracts.

**Introduction to Programming:** Solidity Programming – Basics, functions, Visibility and Activity Qualifiers, Address and Address Payable, Bytes and Enums, Arrays-Fixed and Dynamic Arrays, Special Arrays-Bytes and strings, Struct, Mapping, Inheritance, Error handling.

| Unit:4 | Public Blockchain | 6 Hours |
|---|---|---|

Introduction to Public Blockchain, Ethereum and its Components, Mining in Ethereum, Ethereum Virtual Machine (EVM), Transaction, Accounts, Architecture and Workflow, Comparison between Bitcoin and Ethereum . Types of test-networks used in Ethereum, Transferring Ethers using Metamask, Mist Wallet,

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|---|---|---|
| Ethereum frameworks. | | |
| **Unit:5** | **Private Blockchain** | **7 Hours** |
| Introduction, Key characteristics, Need of Private Blockchain, Smart Contract in Private Environment, State Machine Replication, Consensus Algorithms for Private Blockchain - PAXOS and RAFT, Byzantine Faults: Byzantine Fault Tolerant (BFT) and Practical BFT. Introduction to Hyperledger, Tools and Frameworks, Comparison between Hyperledger Fabric & Other Technologies. Hyperledger Fabric Architecture, Components of Hyperledger Fabric: MSP, Chain Codes, Transaction Flow, Working of Hyperledger Fabric, Creating Hyperledger Network | | |
| **Unit :6** | **Tools and Applications of Blockchain** | **6 Hours** |
| Corda, Ripple, Quorum and other Emerging Blockchain Platforms, Blockchain in DeFi: Case Study on any of the Blockchain Platforms. | | |
| **Total Lecture Hours** | | **38 Hours** |

| | |
|---|---|
| **Textbooks** | |
| **1** | Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhillash K. A and Meena Karthikeyen<br>Universities Press |
| **2** | Mastering Ethereum, Building Smart Contract and Dapps, Andreas M. Antonopoulos Dr. Gavin Wood, O'reilly |
| **Reference Books** | |
| **1** | Blockchain for Beginners, Yathish R and Tejaswini N, SPD |
| **2** | Blockchain with Hyperledger Fabric, Luc Desrosiers, Nitin Gaur, Salman A. Baset, Venkatraman Ramakrishna Packet Publishing |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/ |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://nptel.ac.in/courses/106105235 |
| **2** | https://onlinecourses.nptel.ac.in/noc22_cs44/preview |

## Semester VII

| CSE2421 - PE IV | Cyber Forensic | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. Investigate hardware parts of a computer system for evidences
2. Use different tools for data acquisition and duplication for forensic study
3. Securely store data and evidence collected
4. Create report of forensic investigation made

| Unit:1 | Introduction | 6 Hours |
|---|---|---|

Types of Cyber Crime, Security Attacks, Overview of computer forensics in today's world, computer hardware basics, Computer forensics investigation process, understanding hard disks and file systems, Types of computer forensics.

| Unit:2 | Computer Forensic | 6 Hours |
|---|---|---|

Computer forensic: Data acquisition and duplication, defeating anti-forensics techniques, operating system forensics, Log analysis and event viewer, File auditing, identifying rogue machines, Malware forensic Database forensic.

| Unit:3 | IT Fraud | 6 Hours |
|---|---|---|

IT fraud, Recovery of deleted files, Live Data collection and investigating Linux environment. Password recovery (tools like John the ripper, L0phtcrack, and THC-Hydra), email crimes.

| Unit:4 | Network Forensics | 6 Hours |
|---|---|---|

Network forensics, investigating web attacks, Gathering Tools to create a response toolkit. Hidden files and unauthorized access points. Analyzing network traffic, Sniffers Hardware forensic tools like Port scanning and vulnerability assessment tools like Nmap, Netscan etc.

| Unit:5 | Mobile Forensics | 6 Hours |
|---|---|---|

Mobile Forensics, Live Data collection and investigating on android, ios, windows environment, Investigating report generation, investigation process, acquisition types, tools, report generation

| Unit :6 | Case Studies | 6 Hours |
|---|---|---|

| | |
|---|---|
| Forensics report writing and presentation, Case studies | |
| **Total Lecture Hours** | **36 Hours** |
| **Textbooks** | |
| **1** | Incident Response & Computer Forensics, Second, Mandia, K., Prosise, C., Pepe, M., Tata-McGraw Hill |
| **2** | Guide to Computer Forensics and Investigations, Bill Nelson, Amelia Phillips, Frank Enfinger, and Chris Steuart, Thomson Learning |
| **Reference Books** | |
| **1** | File System Forensic Analysis, Brian Carrier, Wesley |
| **2** | Digital Evidence and Computer Crime, Eoghan Casey, Academic Press |
| **3** | Windows Forensic Analysis DVD Toolkit (Book with DVD-ROM), Harlan Carvey, Syngress Publication |
| **4** | EnCE: The Official EnCase Certified Examiner Study Guide, Steve Bunting, Sybex Publication |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/41-Introductory%20Computer%20%20Forensics.pdf |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | Cyber Security and Cyber Forensics (cdac.in) |
| **2** | https://onlinecourses.swayam2.ac.in/cec20_lb06/preview |

## Semester VII

| CSE2422 - PE IV | Lab. : Cyber Forensic | | L=0 | T=0 | P=2 | CREDITS = 1 |
|---|---|---|---|---|---|---|
| EVALUATION SCHEME | | | | | | |
| MSPA – I | MSPA –II | MSPA – III | MSPA – IV | ESE | TOTAL | ESE DURATION |
| 15 | 15 | 15 | 15 | 40 | 100 | -- |

| Sr. No. | Experiments based on |
|---|---|
| 1 | Study practical on cyber-crime and generation of Hash values on file system |
| 2 | Perform data accusation and imaging on digital evidences |
| 3 | Perform recovery and data carving on digital evidence |
| 4 | Explore and analyses tools on Email analysis an investigation |
| 5 | Password recovery tools, from RAR, DOC, PDF, windows password |
| 6 | Mobile forensics SIM card analysis |
| 7 | Mobile data Analysis |

## Semester VII

| CSE2423 - PE IV | Machine Learning Techniques | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**After undergoing the course, student will be able to**:

1. Understand various supervised machine learning algorithms
2. Understand various unsupervised machine learning algorithms
3. apply supervised and unsupervised learning on the given set of samples and design the model to accomplish the given task.
4. understand various performance evaluation measures for supervised and unsupervised learning

| Unit:1 | Introduction to machine learning | 6 Hours |
|---|---|---|

Overview of Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Reinforcement learning, Classification, Regression, Supervised and Unsupervised Learning, Learning Associations, Machine Learning Workflow, Examples of Machine Learning Applications.

| Unit:2 | Supervised Learning-1 | 6 Hours |
|---|---|---|

Linear and polynomial regression, classification with k-Nearest Neighbours, Naive Bayes Classifiers, Decision Trees, Generalization, logistic regression, bias and variance,Overfitting, and Underfitting

| Unit:3 | Supervised Learning-2 | 6 Hours |
|---|---|---|

Random forests, Kernelized Support Vector Machines, Uncertainty in Multiclass Classification, feature engineering and selection, evaluation metrics for supervised learning

| Unit:4 | Unsupervised Learning | 6 Hours |
|---|---|---|

k-Means Clustering , Choosing the Number of Clusters, Semi-Supervised Learning , Introduction to Principle Component Analysis, evaluation metrics for unsupervised learning

| Unit:5 | Design and Analysis of Machine Learning Experiments | 6 Hours |
|---|---|---|

Factors, Response, and Strategy of Experimentation, Randomization, Hypothesis testing, Replication, and Blocking, Guidelines for Machine Learning Experiments , Cross-Validation and Resampling Methods, K-Fold Cross-Validation, Comparing Two Classification Algorithms.

| Unit :6 | Advances in Machine Learning | 6 Hours |
|---|---|---|

Introduction to learning using Neural networks, types of artificial neuron and activation functions, Feedforward vs. Recurrent networks, multi-layer feedforward networks, Introduction to deep learning, deep learning frameworks.

| Total Lecture Hours | 36 Hours |
|---|---|

**Textbooks**

| | |
|---|---|
| **1** | Introduction to Machine Learning", Ethem Alpaydin, The MIT Press, second edition |
| **2** | Deep learning:Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning (http://www.deeplearningbook.org/) |
| **Reference Books** | |
| **1** | Machine Learning", Tom Mitchell, McGraw-Hill Science/Engineering/Math, 1997 |
| **2** | Introduction to Machine Learning with Python, A Guide for Data Scientists Andreas C. Müller and Sarah Guido ORIELLY |
| **3** | Christopher M. Bishop, Pattern Recognition and Machine Learning. http://research.microsoft.com/enus/um/people/cmbishop/prml/. |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/60.Introduction_to_Machine_Learning_-_2e_-_Ethem_Alpaydin.pdf |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs24/preview |
| **2** | https://onlinecourses.nptel.ac.in/noc21_cs85/preview |

## Semester VII

| CSE2424 - PE IV | | | Lab. : Machine Learning Techniques | | L=0 | T=0 | P=2 | CREDITS = 1 |
|---|---|---|---|---|---|---|---|---|
| EVALUATION SCHEME | | | | | | | | |
| MSPA – I | MSPA –II | MSPA – III | MSPA – IV | ESE | TOTAL | ESE DURATION | | |
| 15 | 15 | 15 | 15 | 50 | 100 | -- | | |

| Sr. No. | Experiments based on |
|---|---|
| 1 | a) Linear regression using linear least squares fit method<br><br>b) Linear regression with Ordinary least squares method using ML Library |
| 2 | Implementing linear classifier using Linear discriminant function |
| 3 | Implementing polynomial regression |
| 4 | Program for Classification using KNN algorithm |
| 5 | Implementing KNN for regression |
| 6 | Implementing Naïve Bayes Classifier |
| 7 | Decision Trees using Scikit-learn |
| 8 | Implementing SVM Classifier |
| 9 | Implementing K-means clustering |
| 10 | Dimensionality reduction using Principal Component Analysis |
| 11 | Implementing a feed forward Neural Network based estimation using Scikit learn |
| 12 | Experiment on classification using Pre-trained deep network |

## Semester VII

| CSE2425 - PE IV | Parallel programming | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1.Strengthen understanding of parallel programming
2.Understand challenges in efficient execution of large-scale parallel applications
3.Massive parallelism entails significant hardware and software challenges
4.Implement research-based project component

| Unit:1 | Introduction | 6 Hours |
|---|---|---|

Introduction: Why parallel computing? Shared memory and distributed memory parallelism, Amdahl's law, speedup and efficiency, supercomputers.
Message Passing : MPI basics, point-to-point communication, collective communication, synchronous/asynchronous send/recv, algorithms for gather, scatter, broadcast, reduce

| Unit:2 | Parallel Communication | 6 Hours |
|---|---|---|

Network topologies, network evaluation metrics, communication cost, routing in interconnection networks, static and adaptive routing, process-to-processor mapping.

| Unit:3 | Performance | 6 Hours |
|---|---|---|

Scalability, benchmarking, performance modeling, impact of network topologies, parallel code analysis and profiling.

| Unit:4 | Designing Parallel Codes | 6 Hours |
|---|---|---|

Domain decomposition, communication-to-computation ratio, load balancing, adaptivity, case studies: weather and material simulation codes

| Unit:5 | Parallel I/O | 6 Hours |
|---|---|---|

MPI I/O algorithms, contemporary large-scale I/O architecture, I/O bottlenecks, Job scheduling, RDMA, one-sided communication, NVM, extreme scale computing: issues and trends.

| Unit :6 | Parallel Algorithms: Basic Principles | 6 Hours |
|---|---|---|

Principles of Parallel Algorithm Design, Basic Communication Operations, Analytical Modeling of Parallel Programs

| Total Lecture Hours | 36 Hours |
|---|---|

| | |
|---|---|
| **Textbooks** | |
| **1** | Peter S Pacheco, An Introduction to Parallel Programming, Morgan Kaufmann, 2011. |
| **2** | DE Culler, A Gupta and JP Singh, Parallel Computer Architecture: A Hardware/Software Approach Morgan-Kaufmann, 1998. |
| **3** | Marc Snir, Steve W. Otto, Steven Huss-Lederman, David W. Walker and Jack Dongarra, MPI - The Complete Reference, Second Edition, Volume 1, The MPI Core. |
| **4** | William Gropp, Ewing Lusk, Anthony Skjellum, Using MPI : portable parallel programming with the message-passing interface, 3rd Ed., Cambridge MIT Press, 2014 |
| **Reference Books** | |
| **1** | JL Hennessy and DA Patterson, Computer Architecture: A Quantitative Approach, 4th Ed., Morgan Kaufmann/Els India, 2006. |
| **2** | MJ Quinn, Parallel Computing: Theory and Practice, Tata McGraw Hill, 2002. |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/26-2018_Book_IntroductionToParallelComputin.pdf |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc21_ge20/preview |
| **2** | https://onlinecourses.nptel.ac.in/noc22_cs67/preview |

## Semester VII

| CSE2426 - PE IV | | | Lab. : Parallel programming | | L=0 | T=0 | P=2 | CREDITS = 1 |
|---|---|---|---|---|---|---|---|---|
| EVALUATION SCHEME | | | | | | | | |
| MSPA – I | MSPA –II | MSPA – III | MSPA – IV | ESE | TOTAL | ESE DURATION | | |
| 15 | 15 | 15 | 15 | 40 | 100 | -- | | |

Practical's based on above Syllabus.

## Semester VII

| CSE2427 - PE IV | Data Mining & Data Warehousing | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 40 | 100 | | 3 Hrs |
| | | | | | | | |

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Understand the functionality of the various data warehousing and data mining components
2. Apply data mining algorithms on sample datasets and analyze the results.
3. Explore recent trends in data mining.
4. Explore Data mining tool/s and emphasize hands-on experience working with all real data sets

| Unit:1 | Data Warehousing and Business Analysis | 5 Hours |
|---|---|---|

Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online
Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

| Unit:2 | Data Mining Introduction | 6 Hours |
|---|---|---|

Introduction to data mining, Process of data mining, Data Mining Functionalities, Data Pre-processing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation, Classification of Data Mining systems, Data Mining Task primitives, Major issues in Data Mining, Applications of Data Mining

| Unit:3 | Mining Frequent Patterns and Association Rules | 6 Hours |
|---|---|---|

Market Basket Analysis, Frequent Item sets and Association rules, A Priori Algorithm, Improving the efficiency of A priori, FP- growth Algorithm

| Unit:4 | Classification and prediction | 7 Hours |
|---|---|---|

Classification: Introduction, decision tree, building a decision tree- the tree induction algorithm, split algorithm based on information theory, gini index, over fitting and pruning, Bayesian Classification – Rule Based Classification –Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods.

| Unit:5 | Clustering | 6 Hours |
|---|---|---|

Types of data in cluster analysis, Categorization of major clustering methods:
Partitioning methods, Hierarchical methods, Applications of clustering.

| Unit :6 | Mining Object, Spatial, Multimedia, Text and Web Data | 6 Hours |
|---|---|---|

| | |
|---|---|
| – Mining the World Wide Web, Text Mining, Spatial Data Mining ,Multimedia Data Mining. | |
| **Total Lecture Hours** | 36 Hours |
| Textbooks | |
| 1 | Data Mining – Concepts and Techniques, Jiawei Han & Micheline Kamber, Morgan Kaufmann |
| 3 | Introduction to Data mining, Pang-ning Tan, Michael Steinbach, Vipin Kumar, Pearson |
| Reference Books | |
| 1 | Data Mining Techniques, Arun K Pujari, University Press |
| 2 | Data Warehousing, Data Mining & OLAP - Alex Berson and Stephen J. Smith, Tata McGraw – Hill Edition, 2007. |
| 3 | Data Warehousing In the Real World, Sam Anahory & Dennis Murray, Pearson |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 |
| **2** | https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042 |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs06/preview |
| **2** | https://nptel.ac.in/courses/106105174 |

## Semester VII

| CSE2428 - PE IV: Lab | | | Data Mining & Data Warehousing | | L=0 | T=0 | P=2 | CREDITS = 1 |
|---|---|---|---|---|---|---|---|---|
| EVALUATION SCHEME | | | | | | | | |
| MSPA – I | MSPA –II | MSPA – III | MSPA – IV | ESE | TOTAL | ESE DURATION | | |
| 15 | 15 | 15 | 15 | 40 | 100 | -- | | |

| Sr. No. | Experiments based on |
|---|---|
| 1 | Explore machine learning tool "WEKA" |
| 2 | Perform data preprocessing tasks on given data sets |
| 3 | Demonstrate performing association rule mining on data sets |
| 4 | Demonstrate performing classification on data sets |
| 5 | Demonstrate performing clustering of data sets |
| 6 | Demonstrate knowledge flow application on data sets-<br>i. Develop a knowledge flow layout for finding strong association rules by using Apriori, FP Growth algorithms<br>ii. Set up the knowledge flow to load an ARFF (batch mode) and perform a cross validation using J48 algorithm |

## Semester VII

| CSE2429 - PE IV | PE IV : Java Full Stack Development | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

CO 1: Understand the core, advance java, cloud and virtualization concepts.
CO 2: Apply the concepts for full stack development.
CO 3: Design different web applications using UI components and Spring framework.
CO 4: Develop fully functional web applications using different frameworks and tools.
CO 5: Implementation of web application using different tools.

| | | |
|---|---|---|
| **Unit:1** | **Java Basics** | **6 Hours** |
| OOP Concepts, Data Structures, Collection Framework, File handling, JDBC, Introduction to JUnit | | |
| **Unit:2** | **Advance Java Features** | **6 Hours** |
| Introduction to Java 8 Features, Interface Enhancements, Functional Interfaces, Lambda Expression, ForEach , Method References, Streams API, JavaDocs | | |
| **Unit:3** | **User Interface Design** | **6 Hours** |
| Building Responsive Web Pages HTML5, CSS3 and JavaScript, Basic Single Page Applications Using Angular OR React | | |
| **Unit:4** | **Spring Framework** | **7 Hours** |
| Working with Spring Core, Dependency Injection, Spring MVC,Spring Boot, Introduction to Hibernate and Spring Microservices | | |
| **Unit:5** | **Cloud and Virtualization** | **7 Hours** |
| Virtualization Basics, Introduction to Cloud, RDB Cloud Fundamentals (SaaS, Paas, IaaS), Introduction to AWS (S3 Buckets, RDS), AWS Cloudfront | | |
| **Unit :6** | **Full Stack Development Tools** | **7 Hours** |
| Introduction to Maven,Jacoco, SonarLint,Jira, Swagger,Mockito,Docker, Gitrunner | | |
| **Total Lecture Hours** | | **39 Hours** |

**Textbooks**

| | |
|---|---|
| **1** | The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Developer, Chris Northwood, first Edition, Apress Publication<br>First Edition |

| | |
|---|---|
| **2** | Full Stack Web Development For Beginners: Learn Ecommerce Web Development using HTML5,CSS3,Bootstrap, JavaScript,MySQL and PHP, Riaz Ahmed, Amazon Digital Services ,First Edition |
| **Reference Books** | |
| **1** | Full Stack Java Development with Spring MVC, Hibernate, jQuery, and Bootstrap , Mayur Ramgir Wiley Publication, First Edition |
| **2** | Java for Web Development: Create Full-Stack Java Applications with Servlets, JSP Pages, MVC Pattern and Database Connectivity, Sarika Agarwal and Vivek Gupta ,BPB Publication, First Edition |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/javabook.pdf |
| **2** | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/JavaScript%20Programmer's %20Reference.pdf |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs14/preview |
| **2** | https://nptel.ac.in/courses/106105167 |

## Semester VII

| CSE2430 - PE IV | | | Lab. : Java Full Stack Development | | L=0 | T=0 | P=2 | CREDITS = 1 |
|---|---|---|---|---|---|---|---|---|
| EVALUATION SCHEME | | | | | | | | |
| MSPA – I | MSPA –II | MSPA – III | MSPA – IV | ESE | TOTAL | ESE DURATION | | |
| 15 | 15 | 15 | 15 | 50 | 100 | -- | | |

| Sr. No. | Experiments based on |
|---|---|
| 1 | Practical based on Collection |
| 2 | Practical based on File Handling |
| 3 | Practical based on JDBC |
| 4 | Practical based on Junit |
| 5 | Practical based on Java 8 features |
| 6 | Practical based on Streams API |
| 7 | Practical based on User Interface Design |
| 8 | Practical based on Spring Microservices |
| 9 | Web Application Development |
| 10 | Web Application Development |

## Semester VII

| CSE2431 - PE IV | PE IV : .Net Full Stack Development | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**After undergoing the course, student will be able to**:

1. Understand the concept of .NET full Stack Development using using C#, ASP, MVC Controller.
2. Apply the Concept in .NET full stack development.
3. Design various applications using .NET framework.

| | | |
|---|---|---|
| **Unit:1** | **Introduction .NET** | **6 Hours** |
| Introduction .NET, application and structure of application, Object Oriented Programming Concept in C#, Exceptional Handling, Delegates and Events | | |
| **Unit:2** | **Introduction to Database** | **6 Hours** |
| LINQ, SQL Sever, DataBase Object introduction, Sql, Triggers | | |
| **Unit:3** | **Introduction to Frontend** | **6 Hours** |
| ADO.NET, HTML, CSS, UI and Front End, Java Script | | |
| **Unit:4** | **MVC** | **7 Hours** |
| What is MVC, components, Interaction among components, Program.cs and StartUp.cs file, Configure Services and Configure Methods, Middleware components, Model View Controllers, Creating first app in MVC | | |
| **Unit:5** | **Implemention Data Validation** | **7 Hours** |
| Implementing data validation, annonations and Validation Summary and Exception handling mechanims in MVC, what is API, create project, test API, API Controllers, configure Web API,routing, parameter binding | | |
| **Unit :6** | **DevOps** | **7 Hours** |
| Introduction to Coding Principle, DevOps, Docker | | |
| **Total Lecture Hours** | | **39 Hours** |

**Textbooks**

| | |
|---|---|
| **1** | ASP.NET Core 3 and Angular 9: Full stack web development with .NET Core 3.1 and Angular 9, 3rd Edition Third by Valerio De Sanctis |
| **2** | The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern |

| | |
|---|---|
| | Full Stack Web Developer by Chris Northwood |
| **Reference Books** | |
| **1** | Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker by Frank Zammetti |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/dotNET_Tutorial_for_Beginners.pdf |
| **2** | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/JavaScript%20Programmer's%20Reference.pdf |

## Semester VII

| CSE2432 - PE IV | | | Lab. : .Net Full Stack Development | | L=0 | T=0 | P=2 | CREDITS = 1 |
|---|---|---|---|---|---|---|---|---|
| EVALUATION SCHEME | | | | | | | | |
| MSPA – I | MSPA –II | MSPA – III | MSPA – IV | ESE | TOTAL | ESE DURATION | | |
| 15 | 15 | 15 | 15 | 50 | 100 | -- | | |

| Sr. No. | Experiments based on |
|---|---|
| 1 | Program Based on object oriented programming concepts in C# |
| 2 | Program Based on Exceptional Handling |
| 3 | Program Based on Delegates and Events |
| 4 | Program Based on LINQ |
| 5 | Program Based on SQL Server database objects |
| 6 | Program Based on SQL Triggers |
| 7 | Program Based on ADO.Net for connectivity with database |
| 8 | Program Based on MVC Validations and Exception Handling |
| 9 | Web Application project |

## Semester VII

| CSE2441 - PE V | Cloud Computing | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. Explain software and hardware support for enterprise and cloud computing.
2. Perform data modelling for enterprise and cloud knowledge bases.
3. Design enterprise and cloud software applications.
4. Implement and run distributed and cloud applications.
5. Ensure security and privacy in enterprise and cloud application while implementing cloud applications methodologies.

| Unit:1 | Introduction to Cloud Computing | 6 Hours |
|---|---|---|

Defining Cloud Computing; Cloud Types and different models-The NIST model, The Cloud Cube Model, Deployment models, Service models; Examining the Characteristics of Cloud Computing; Benefits of cloud computing; Disadvantages of cloud computing; Assessing the Role of Open Standards.

| Unit:2 | Cloud Architecture, Services and Applications | 6 Hours |
|---|---|---|

Exploring the Cloud Computing Stack, Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, Saas Vs. Paas, Using PaaS Application Frame works, Software as a Service, Identity as a Service, Compliance as a Service.

| Unit:3 | Abstraction and Virtualization | 6 Hours |
|---|---|---|

Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context.

| Unit:4 | Exploring Cloud Infrastructures | 6 Hours |
|---|---|---|

Managing the Cloud-Administrating the Clouds, Management responsibilities, Lifecycle management Cloud Management Products, Emerging Cloud Management Standards, Understanding Service Oriented Architecture- Introducing Service Oriented Architecture.

| Unit:5 | Managing & Securing the Cloud | 6 Hours |
|---|---|---|

Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards, Securing the Cloud, Securing Data, the security boundary, Security service boundary, Security mapping, Brokered

| | | |
|---|---|---|
| cloud storage access, Establishing Identity and Presence. | | |
| **Unit :6** | **Advance Clouds and Case Studies** | **6 Hours** |
| Cloud Computing Cost Analysis, basic, Selecting an IaaS Provider, Capacity Planning and Disaster, Recovery in Cloud Computing, AWS Cloud architectural principles, basic/core characteristics of deploying and operating in the AWS Cloud, the key services on the AWS Platform and their common use cases, Define the billing, account management, and pricing models, Introduction to Amazon EC2. Case Studies: Microsoft Azure, Dropbox. | | |
| **Total Lecture Hours** | | **36 Hours** |

| | |
|---|---|
| **Textbooks** | |
| **1** | Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Michael Miller, Springer |
| **2** | Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc., Rajkumar Buyya, James Broberg, Andrzej Goscinski, A John Wiley & Sons, Inc. Publication |
| **Reference Books** | |
| **1** | Mastering cloud computing, Rajkumar buyya, Christian vecchiola, S Thamarai Selvi, Tata Mc-Graw Hill Education Private Limited |
| **2** | Cloud Computing a Practical Approach, Anthony T .Velte, Toby J. Velte, Robert Elsenpeter, Tata Mc-Graw-HILL |
| **3** | Cloud computing bible, Barrie sosinsky, Wiley publishing |
| **4** | https://cloud.google.com/appengine/docs<br>https://www.chef.io/solutions/cloud-management/<br>https://aws.amazon.com/documentation<br>https://dev.twitter.com/overview/documentation<br>https://developers.facebook.com/<br>https://www.cloudfoundry.org/<br>https://puppet.com/blog/implement-a-message-queue-your-cloud-applicati |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/DTEL%20Material/7.Information%20Technology/DTEL%20PPTs<br>/18.CC%20PPT_ADG.pdf |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs14/preview |
| **2** | https://nptel.ac.in/courses/106105167 |

## Semester VII

| CSE2442 - PE V | Distributed System | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. Identify the advantages and challenges in designing distributed algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc.
2. Design and develop distributed programs using sockets and RPC/RMI.
3. Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems.
4. Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constrain

| Unit:1 | Characterization of Distributed Systems | 6 Hours |
|---|---|---|

Architecture of Distributed Systems: Characteristics of Distributed System, Motivation, challenges /Issues in the design & development of Distributed System. System Models: Architecture Model, System Architecture, Types of Architectural Model: Client server model, Search engine, Proxy server & caches, Variation on client server model: mobile code, mobile agents. Fundamental Models: Interaction model, failure model, Security model. Distributed Objects & Distributed file System: Inter-process communication, Sockets, middle ware, Group communication, and Remote procedure calls. CORBA, RMI, Distributed file system, Name services, Directory services, File Service types, download/upload model, File sharing semantics, session semantics, Server design: stateless & stateful server, Cache update policies.

| Unit:2 | Theoretical Foundations | 6 Hours |
|---|---|---|

Inherent limitations of distributed systems, Timing issues, clock synchronization, Network time protocol, Lamport's logical clocks, Vector clocks, Casual ordering of messages, Global state, Cuts of Distributed computation, Termination detection.

| Unit:3 | Distributed Mutual Exclusion | 6 Hours |
|---|---|---|

Leader election: Chang Robert Ring based leader election algorithm, Bully algorithm. Classification of mutual exclusion algorithms, Requirements and performance measures of mutual exclusion algorithms, Non Token Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm.Token Based Algorithms: SuzukiKasami's Algorithm, Raymond's Algorithm, Comparative performance analysis

| | | |
|---|---|---|
| **Unit:4** | **Distributed Deadlock Detection** | **8 Hours** |
| Resource vs Communication deadlocks, graph theoretic model, deadlock prevention, avoidance, detection, Issues in deadlock detection and resolution, Centralized deadlock detection algorithms, distributed deadlock detection algorithms | | |
| **Unit:5** | **Agreement Protocols** | **8 Hours** |
| Synchronous vs. asynchronous computations, model of process failures, authenticated vs. non-authenticated messages. A classification of Agreement problems, Solutions to Byzantine Agreement problem, Applicatons of Agreement algorithms. | | |
| **Unit :6** | **Failure recovery and Fault Tolerance** | **7 Hours** |
| Classification of failures. Backward and forward error recovery, Basic approaches of backward error recovery, recovery in concurrent systems, consistent set of checkpoints, synchronous check pointing and recovery, asynchronous check pointing and recovery. Fault Tolerance: Atomic actions and committing, commit protocols, non-blocking commit protocols, Voting protocols, Dynamic voting protocols, Dynamic Vote Reassignment Protocols | | |
| **Total Lecture Hours** | | **36 Hours** |

| | |
|---|---|
| **Textbooks** | |
| **1** | Advanced Concepts In Operating Systems: Distributed, Multiprocessor and Database Operating Systems Mukesh Singhal and Niranjan G. Shivaratri McGraw Hill |
| **2** | Distributed Operating Systems Concepts and Design, G Coulouris, Jean Dollimore, Tim Kindberg Addison Wesley |
| **Reference Books** | |
| **1** | Distributed Algorithms, Nancy Lynch ,Morgan Kaufman |
| **2** | Modern Operating Systems , Andrew S. Tanenbaum, Pearson Education |
| **3** | Distributed Operating Systems: Concepts and Design, Pradeep K. Sinha, Prentice-Hall of India |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/45-Operating%20System%20Concepts%20(%20PDFDrive%20).pdf |
| **2** | http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Operating%20System%20Concept%208thedition.pdf |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs87/preview |

## Semester VII

| CSE2443 - PE V | Human Computer Interaction | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1) Understand the basics of Human Computer Interaction.
2) Demonstrate the Understanding of Interaction between human and computer Components using screen designing concepts.
3) Apply the knowledge of human and computer components for interaction.
4) Evaluate System using different tools and techniques.

| Unit:1 | Introduction | 7 Hours |
|---|---|---|

The human: Human memory, Thinking reasoning and problem solving, Individual differences, Psychology and the design of interactive systems ,Interaction and paradigms: Models of interaction, Frame work and HCI Ergonomics, Interaction styles, Elements of the WIMP(windows, icons, menus, pointers) interface interactivity, The context of the interaction, paradigms for interaction.

| Unit:2 | Interaction Design | 7 Hours |
|---|---|---|

Interaction Design: What is interaction design, Good and poor design, The process of design, User focus, Scenarios, Navigation design, Understanding the problem space, Conceptualizing the design space, Theories, models and frameworks, Screen design and layout, Interaction and prototyping.

| Unit:3 | HCI | 6 Hours |
|---|---|---|

HCI in software process and Design rules: The software life cycle, Usability engineering, Iterative design and prototyping, Design rationale, Principles to support usability, Standards, Guidelines, Golden rules and heuristics, HCI patterns.

| Unit:4 | Implementation and Evaluation | 7 Hours |
|---|---|---|

Implementation supports and Evaluation techniques: Elements of windowing system, Programming application, Using toolkits, User interface management systems, What is evaluation? Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, choosing evaluation methods, analytical evaluation.

| Unit:5 | Universal Design | 6 Hours |
|---|---|---|

Universal Design and User Support: Universal design principles, Multi-modal interaction, Design for diversity, Requirements of user support, Approach to user support, Adaptive help systems, Design user

| | | |
|---|---|---|
| support systems. | | |
| **Unit :6** | **Cognitive Models** | **6 Hours** |
| Cognitive Models and Distributed Cognition: Goal and task hierarchies, Linguistics models, Challenges of display-based systems, Physical models, Cognitive architectures, Scientific Foundation, Description, Case Study. | | |
| **Total Lecture Hours** | | **39 Hours** |

| | |
|---|---|
| **Textbooks** | |
| **1** | Human - Computer Interaction, Alan Dix, Janet Fincay, Gregory D. Abowd and Russell Bealg, Pearson Education, 2003. |
| **2** | Designing the user interface, Ben Shneiderman, Pearson Education Asia, 2004 |
| **Reference Books** | |
| **1** | Interaction Design, Preece and Rogers, Sharp, Wiley-India, 2008. |
| **2** | The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech, 2009 |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/25.BOOK1-Human_computer_interaction.pdf |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc19_cs86/preview |

## Semester VII

| CSE2444 - PE V | Real Time System | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 40 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1.Clearly differentiate the different issues that arise in designing soft and hard real-time, concurrent, reactive, safety-critical and embedded systems.
2.Explain the various concepts of time that arise in real-time systems.
3.Describe the design and implementation of systems that support real-time applications. Justify and critique facilities provided by real-time operating systems and networks.
4.Design, construct and analyze a small, concurrent, reactive, real-time system.
5.Select and use appropriate engineering techniques, and explain the effect of your design decisions on the behavior of the system.

| Unit:1 | Basic Real- Time Concepts, Computer Hardware, Language Issues | 6 Hours |
|---|---|---|

Basic component Architecture, Real Time Design Issues, Input- Output, Other Devices Language Features, Survey of Commonly Used Programming Languages, Code Generation.

| Unit:2 | Software life cycle, Real Time Specification and Design Techniques | 6 Hours |
|---|---|---|

software life cycle, Non-temporal Transition in the software life cycle, Spiral model, Natural languages, Mathematical Specification, Flow Charts, Structure Charts, Pseudocode and programmable Design Languages,

| Unit:3 | Intertask Communication and Synchronization, Real Time memory Management, SystemPerformance Analysis and Optimization | 6 Hours |
|---|---|---|

Buffering Data, Mail boxes Critical Region, Semaphores, Event Flags and Signals, Deadlock, Process Stack Management, Dynamic Allocation, Static Schemes, Response Time Calculation, Interrupt Latency, Scheduling NP Complete, Relocating Response Times And time Loading, Analysis of Memory Requirements, Reducing Memory Loading, I/O Performance.

| Unit:4 | Queuing Models, Reliability, Testing, And Fault Tolerance, Multiprocessing Systems | 6 Hours |
|---|---|---|

Basic Buffer size Calculation, Classical Queuing Theory, Little's Law, Faults, Failures ,bugs AND effects. Reliability, Testing, Fault Tolerence, Classification of Architectures, Distributed Systems, Non Von Neumann Architectures.

| Unit:5 | Hardware/ Software Integration, Real Time Applications | 6 Hours |
|---|---|---|

Goals of Real Time System Integration, Tools, Methodology, Real Time Systems As Complex System, First Real Time Application Real Time Databases, Real time Image Processing Real Time UNIX, building Real Time Applications with Real Time Programming Languages.

| | |
|---|---|
| **Total Lecture Hours** | **36 Hours** |

| | |
|---|---|
| **Textbooks** | |
| **1** | Real Time System, Jane W.S.Liu |
| **2** | Real Time Systems Design and Analysis by Phillip A. Laplante,PHI |
| **Reference Books** | |
| **1** | Hard Real Time Computing Systems Predictable Scheduling Algorithms and applications by GiorgioC. Buttazzo |
| **2** | Real Time Design Patterns: Robust Scalable Architecture for Real Time System by BrucePowel Douglass |
| **3** | Real Time System: Scheduling, Analysis and Verification by Albert M.K. Change |
| **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]** | |
| **1** | http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/53.Book-Liu-%20Real%20Time%20Systems.pdf |
| **2** | |
| **MOOCs Links and additional reading, learning, video material** | |
| **1** | https://onlinecourses.nptel.ac.in/noc21_cs98/preview |

## Semester VII

| CSE2445 - PE V | Big Data Analytics | | | L= 3 | T=0 | P=0 | Credits=3 |
|---|---|---|---|---|---|---|---|
| Evaluation Scheme | MSE-I | MSE-II | TA | ESE | Total | | ESE Duration |
| | 15 | 15 | 20 | 50 | 100 | | 3 Hrs |

**Course Outcomes:**

**Upon successful completion of the course the students will be able to**

1. **Understand** fundamentals of big data, issues in big data management, big data analytics and its associated applications in intelligent business and scientific computing
2. **Apply** machine Learning algorithms for real world data, to provide analytics
3. **Demonstrate** the Map Reduce programming model to process the big data along with Hadoop tools
4. **Illustrate** the concepts of NoSQL using MongoDB and Cassandra for BigData.

| Unit:1 | Introduction to Big Data | 5 Hours |
|---|---|---|

Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, big data environment terminologies, Big Data Analysis Life Cycle.

| Unit:2 | Big data analytics and Analytical methods | 8 Hours |
|---|---|---|

Overview of business intelligence, Characteristics and need of big data analytics, Classification of analytics, Challenges to big data analytics. Analytical operations: Associations rules- Apriori algorithm, classifications- decision trees, naïve bayes clustering- K means.

| Unit:3 | Hadoop foundation for analytics | 6 Hours |
|---|---|---|

Features, key advantages of Hadoop , key aspects of Hadoop, versions of Hadoop , Hadoop ecosystem ,and Components, HDFS, HBase, Hadoop Technology Stack: Hive, Pig, Zookeeper, Swoop, oozie, flume, etc. Hadoop distributions, Hadoop vs SQL

| Unit:4 | MapReduce and YARN framework | 6 Hours |
|---|---|---|

Introduction to MapReduce, Processing data with MapReduce, map reduce example, Introduction to YARN, YARN architecture , Data serialization and common serialization formats, Big data serialization formats.

| Unit:5 | NoSQL Databases | 5 Hours |
|---|---|---|

Introduction to NoSQL, advantages of NoSQL, SQL vs NoSQL, types of NoSQL databases- Schema-less Models‖: Increasing Flexibility for Data Manipulation-KeyValue Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases , Hive -- Sharding –- Hbase

| Unit :6 | Introduction to MongoDB key features | 6 Hours |
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|---|---|
| Introduction to MongoDB key features, data types in MongoDB, MongoDB Query Language.: update remove, insert methods, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document searching, Constructing queries on Databases, documents | |
| **Total Lecture Hours** | **36 Hours** |
| **Textbooks** | |
| **1** | Big Data and Analytics ,Seema Acharya, Subhashini Chhellappan , Willey 2nd edition |
| **2** | Professional Hadoop Solutions, Boris lublinsky, Kevin T.Smith, Alexey Yakubovich ,Wiley ISBN: 978-1-118-61193-7 September 2013 |
| **3** | Understanding Big data , Chris Eaton,Dirk derooset al. , McGraw Hill |
| **4** | BIG Data and Analytics ,Sima Acharya, Subhashini Chhellappan , Willey |
| **Reference Books** | |
| **1** | MongoDB in Action , Kyle Banker, Piter Bakkum, Shaun Verch, Dream tech Press |
| **2** | Big Data Analytics with R and Hadoop , Vignesh Prajapati, Packet Publishing |
| **3** | Tom White, HADOOP: The definitive Guide, O Reilly, 2012 |
| **4** | Learning Spark: Lightning-Fast Big Data Analysis Paperback , Holden Karau |
| **MOOCs Links and additional reading, learning, video material** | |
| 1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview | |