University of Mumbai

# Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-HSD 2020)

*(Under TCET- Autonomy scheme-2020)*

Estd. in 2001

# Scheme & Syllabus under Autonomy

**(w.e.f. Academic Year 2020-2021 onwards)**

**B. E. COMPUTER ENGINEERING**

**(Semester – III to VIII)**

DEPARTMENT OF COMPUTER ENGINEERING(COMP)

(Accredited by NBA for 3 years, 3rd Cycle Accreditation w.e.f. 1st July 2019)

Jagdu Singh Charitable Trust's (Regd.)

**THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY**

Autonomous College Affiliated to University of Mumbai

Approved by All India Council for Technical Education(AICTE) and Government of Maharashtra

Institute Accredited by National Assessment and Accreditation Council (NAAC), Bangalore#

Programmes Accredited by National Board of Accreditation (NBA), New Delhi*

Conferred Autonomous Status by University Grants Commission (UGC) for 10 years w.e.f. AY 2019-20

Amongst Top 200 Colleges in the Country where Ranked 193rd in NIRF India Ranking 2019 in Engineering College category

*Permanent Affiliated UG Programmes : • Computer Engineering • Electronics & Telecommunication Engineering • Information Technology (w.e.f. A.Y. 2015-16) • Electronics Engineering (w.e.f. A.Y. 2017-18)

*3rd cycle NBA Accredited UG Programmes : • Computer Engineering • Electronics & Telecommunication Engineering • Information Technology (3 years w.e.f. 01-07-201

# 1st cycle of NAAC Accreditation : • "A" Grade for 5 years (w.e.f. 30-10-2017)

## VISION STATEMENT OF THAKUR COLLEGE Of ENGINEERING AND TECHNOLOGY

"Thakur College of Engineering and Technology will excel in Technical Education to become an internationally renowned premier Institute of Engineering and Technology"

## MISSION STATEMENT OF THAKUR COLLEGE Of ENGINEERING AND TECHNOLOGY

"To provide state-of-the-art infrastructure and right academic ambience for developing professional skills as well as an environment for growth of leadership and managerial skills to students which will make them competent engineers to deliver quality results in industry"

# Foreword

Thakur College of Engineering and Technology (TCET) since its inception has been instrumental in offering quality technical education to aspiring students through System-Driven-Student-Centric approach. In the last decade, it has put its best efforts to focus on broad based education leading to Holistic Student Development as per international graduate attributes. Based on our strengths, we are happy to share that the University Grants Commission (UGC) has conferred "Autonomous Status" for 10 years to TCET under the revised UGC Graded Autonomy Scheme 2018.

As per the mandate of UGC under Graded Autonomy Scheme, TCET aspires to strengthen its program offerings to make our budding Engineers" Globally competent, Locally Relevant and Skill Oriented" through:

Program Specific curricula with focus on research in the emerging areas of Engineering and Technology.
Industry Specific/ Industry linked curricula through and "Employability Enhancement Scheme".
All Round personality development model through its "Holistic Student Development".
Extraordinary credits for National level achievements, National Level Competition Exams, Standard Industrial Certifications and major contributions to the society.
Credits for specialised courses and online courses done through graded online MOOCS and other graded online courses offered by the department from time to time.

The Choice Based Credit Grading system for Holistic Student Development (CBCGS-HSD 2020) is based on AICTE model curriculum and UGC (Minimum standards of instruction for grant of First Degree through Formal Education) Regulations, 2003 Autonomy Scheme includes Scholastic, Co-Scholastic and Non-Scholastic Credits which are compulsory for every student. Additional credits are assigned for the Student Achievers under Specialization (optional credits in Emerging Areas) and Achievers credits (National/ International level).

The Under-Graduate and the Post-Graduate curriculum has been designed with the thought of creating and inspiring Academic Culture in the Institution, essential for teachers and students to access deeper knowledge and participate in its expansion and smooth transmission. The curriculum also focuses on to develop problem solving skill in students and strengthen academic knowledge. The Doctoral Programme will follow the UGC Guidelines/Norms from time to time.

The First Year (F.E.) proposed scheme is aligned with the Model Curriculum which offers courses of Basic Sciences, Engineering Sciences along with Humanities which imparts the fundamental importance of science to the students which could later be useful for Research in Applied Science and Engineering. The scheme also emphasizes on professional skills which include Aptitude/ Logic Building and Life/Presentation Skills. In addition to the above, the course also comprises of Activity Based Learning which focuses on Society Outreach Programs and Yogic Practices. This will help students to develop Aptitude and Positive Attitude in life.
The Second Year (S.E.) proposed scheme includes Program Specific core subjects which would introduce to them the core areas of the particular course giving them in-depth knowledge and form the basic foundation in them.

The Third Year (T.E.) scheme offers Domain-Specific "Industry Electives" and "Open Electives" which satisfy the current industry demands and requirements. The student's knowledge enhances and makes them abreast with the current Technology. The syllabus scheme provides credits for online courses from Semester VI onwards. This is to motivate the students to enhance their knowledge and encourage Self-Learning among students.

The Final year, Bachelor of Engineering (B.E.) scheme is aligned towards Generalized Knowledge which is an important component of crystallized Intelligence. It is done by offering them "Open Electives" which would help them grow both on personal as well as academic level and develop the openness to experience and analyse situations for better solutions.

The impact of these could be seen under Project Based Learning (PBL), Activity Based Learning (ABL) and Research Based Learning (RBL) as students adopt these methodologies to do projects based on Technological Solutions or real-world scenarios.

The curriculum also focuses on promoting Holistic Student Development (HSD) which includes courses on Employability Skill Development which focus on Industry Specific skills, Professional skills which focus on basic Technology skills for 2nd year, industry/ research/ entrepreneurship skills for 3rd and Final Year. PBL is common for S.E., T.E. and B.E. under HSD along with ABL (Co-curricular/ Extra-curricular/ Extension) for S.E. students and RBL for T.E. & B.E. students. The students are also encouraged to take up internships at core companies which would enhance their skills and make them updated with the current industry needs.

For summer internship and activity points the students are also encouraged to take up inhouse internship and other activities which include Participation in Hackathon, Development of new Product/ Business Plan / Registration of start-up, Participation in IPR workshop/Leadership talks/Idea/ Design / Innovation/Technical Expos, Internship with Industry / Govt. / NGO/ PSU/MSME/Online Internship, Long Term Goals under Rural Internship.
As per AICTE, Students has to earn 100 Points by participating in 400 Hrs. of activities during 4 years of Engineering.

The Examination Scheme is also revised and has been made keeping in view the kind of pressure, student undergoes during continuous evaluation. The proposed scheme includes Formative and Summative Evaluation methods which would help in foster development and improvement in student during the course and simultaneously be able to assess whether the results have been able to meet the set target. This system will be deployed systematically which will drastically reduce the burden on the students.

This scheme would help students to grow academically, professionally, and holistically to become Globally Competent Professionals with Values.

Sd/-
**Dr. B. K. Mishra**
**Principal**

## VISION STATEMENT OF DEPARTMENT OF COMPUTER ENGINEERING

"To become the department of national relevance in the field of Computer Engineering"

## MISSION STATEMENT OF DEPARTMENT OF COMPUTER ENGINEERING

"To nurture students with sound engineering knowledge in the field of computing through effective use of modern tools with a focus on global employability by imbibing leadership qualities, ethical attitude, lifelong learning and social sensitivity"

## Program Educational Outcomes:

| | |
|---|---|
| PEO 1 | To **attract** and **prepare** learners to **attain** sound *knowledge* in the field of Computer engineering.<br>1.1. To **attract** students **by** *providing* conducive academic environment and to **enhance** *quality* of students **by rigorous monitoring** and control.<br>1.2. To **prepare** learners with a *sound foundation* in the mathematical, scientific and engineering fundamentals.<br>1.3. To **prepare** learners to *use modern tools* effectively to solve real life problems.<br>1.4. To **equip** learners with *broad education* relevant to field of computing in the global and social context. |
| PEO 2 | To **prepare** learners to **attain** *need-based skills* and *competencies* with a focus on *futuristic needs* at the national and international level.<br>2.1. To **ensure** *employability* by need-based training spread over the entire course and contemporary *local* and *global requirements.*<br>2.2. To **prepare** Learners for *higher studies* and *life-long learning* through active involvement of learners with *research oriented* and *industry-based projects*. |
| PEO 3 | To **prepare** learners to become *valued professionals and responsible citizens.*<br>3.1. To **encourage** and **motivate** students through *well planned* co-curricular and extra-curricular activities for *all-round personality development.*<br>3.2. To **inculcate** professional and *ethical* ***attitude,*** *leadership qualities* and *commitment to* social *responsibilities.* |

## Program Outcomes:

| | |
|---|---|
| PO 1 | **ENGINEERING KNOWLEDGE: Apply** Knowledge of Mathematics, Science, engineering fundamentals and an engineering specialization to the **solution** of **complex** engineering **problems.** |
| PO 2 | **PROBLEM ANALYSIS: Identify,** F**ormulate, Research** Literature and **Analyze** Complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. |
| PO 3 | **DESIGN / DEVELOPMENT OF SOLUTIONS: Design** solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations. |
| PO 4 | **CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS:** Using research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions |
| PO 5 | **MODERN TOOL USAGE: Create**, **select** and **apply** appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of limitations. |
| PO 6 | **THE ENGINEER AND SOCIETY: Apply** reasoning informed by contextual knowledge to **assess** societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice. |
| PO 7 | **ENVIRONMENT AND SUSTAINABILITY: Understand** the impact of professional engineering solutions in societal and environmental contexts and **demonstrate** knowledge of and need for sustainable development. |
| PO 8 | **ETHICS: Apply** ethical principles and commit to professional ethics and responsibilities and norms of engineering practices. |
| PO 9 | **INDIVIDUAL AND TEAM WORK: Function** effectively as an individual, and as a member of leader in diverse teams and in multi-disciplinary settings. |
| PO 10 | **COMMUNICATION: Communicate** effectively on complex engineering activities with the engineering community and with society at large, such as being **able** to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions. |
| PO 11 | **LIFE-LONG LEARNING: Recognize** the *need* for and have the preparation and **ability** to engage in *independent* and *life-long learning* in the broadest context of technological change. |
| PO 12 | **PROJECT MANAGEMENT & FINANCE: Demonstrate** *knowledge* and *understanding* of engineering and management and leaders in a team to manage projects and in multidisciplinary environments. |

## Program Specific Outcomes:

| | |
|---|---|
| PSO 1 | Ability to develop academic aptitude and apply knowledge of computing and mathematics to computer science problems and thereby design and develop Software and Hardware Systems. |
| PSO 2 | Ability to enhance research skills and utilize advanced computing tools for analysis, design and implementation of computing systems for resolving real life / social problems |
| PSO 3 | Ability to utilize multidisciplinary knowledge required for satisfying industry / global requirements and hence develop an attitude for life-long learning. |
| PSO 4 | Ability to have all round personality with skills like leadership, verbal & written communication , team work, sensitivity towards society in order to become valued and responsible professionals. |

# INDEX

**S.E. Semester –III (Computer Engineering)**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)**
**TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)**

| Course Description | | | Teaching Scheme (Program Specific) | | | | | Examination scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr. No. | Course Code | Course Title | Modes of Teaching / Learning / Weightage | | | | | Modes of Continuous Assessment / Evaluation | | | | |
| | | | Hours Per Week | | | | Credits | Theory (100) | | Practical/ Oral (25) | Term Work (25) | Total |
| | | | Theory | Tutorial | Practical | Contact Hours | | IA(25) | ESE(75) | PR/OR | TW | |
| 1 | BSC-CS301 | Mathematics-III | 3 | 1 | - | 4 | 4 | 25 | 75 | - | 25 | 125 |
| 2 | PCC-CS301 | Data Structures | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 3 | PCC-CS302 | Database Management System | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 4 | PCC-CS303 | Digital Logic Design & Analysis | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 5 | PCC-CS304 | Computer Organization & Architecture | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| | | **Total** | **15** | **1** | **8** | **24** | **20** | | | **Total marks** | | **725** |
| **Course Description** | | | **Non Credited Mandatory Course (Passing is mandatory for this course)** | | | | | | | | **Term Work** | |
| 1 | MC-CS301 | Environmental Studies | 1 | - | - | 1 | (Non Credit) | - | | | 25 | **25** |
| **Course Description** | | | **Contact Hrs. during Week End / Semester Break/ End of Semester (Between 21st and 25th Week)** | | | | | | | | | |
| **1** | SI-CS301 | Summer Internship | - | - | - | 160 * - 240* | - | - | - | - | - | - |
| **Course Description** | | | **Contact Hrs. during Week End / Semester Break/ End of Semester (Between 21st and 25th Week)/During Semester** | | | | | | | | | |
| 1 | AP-CS301 | Activity Points | - | - | - | **48@** | - | - | - | - | - | - |
| **Course Description** | | | **Teaching scheme (Holistic Student Development -HSD) (Conducted in the beginning of Semester during first 3 Weeks)** | | | | | **Assessment/Evaluation Scheme** | | | | |
| | | | | | | | | **Presentation** | | **Report** | | **Term Work** |
| | | | | | | | | **AC** | | **AC** | | |
| 1 | ESD-CS301 | Employability Skill Development - I | - | - | 30 | 30 | 1 | Based on Parameters Decided by Training and Placement Cell | | | | 50 |
| 2 | HSD - CSPS301 | Professional Skills- III (Object oriented Programming using Java) | 15 | - | 30 | 45 | 2 | 50 | | 25 | | 75 |
| 3 | HSD - CSPBL301 | Project Based Learning - I | - | - | 30 | 30 | 1 | 25 | | - | | 25 |
| 4 | HSD - CSABL301 | Activity Based Learning-III (Co-curricular/Extra Curricular/Extension) | - | - | 30 | 30 | 1 | 25 | | 25 | | 50 |
| | | **Total** | **15** | **-** | **120** | **135** | **5** | | | **Total marks** | | **200** |
| | | **Total** | | | | | **25** | | | **Grand Total marks:** | | **950** |

1. IA- In-Semester Assessment, ESE- End Semester Examination, PR- Practical Examination, TW – Term Work Examination, OR- Oral Examination, AC- Activity evaluation

* This is part of Summer Internship but can start in winter. Students may go upto 240 hrs. to aquire maximum 6 credits in Semester 4.

Total hrs. mentioned should be completed till end of Semester 4. Credits will be awarded at the end of 4th Semester and will be reflected in the Grade Card of 4th Semester.

Student will get 1 year span to acquire the credits. Students should collectively acquire total contact hrs in below given activities in a span of 1 year. Student will submit a report to earn Term work marks in internship.

**Following activities should be considered for Summer Internship:-**

1) Participation in inhouse internship at the end of 3rd and 4th Semester of 2 week each.
2) Other activity which also will be considered are: Participation in Hackathon, Development of new Product/ Business Plan / Registration of start-up, Participation in IPR workshop/Leadership talks/Idea/ Design / Innovation/Technical Expos, Internship with Industry / Govt. / NGO/ PSU/MSME/Online Internship, Long Term Goals under Rural Internship

Note:- For Above Activities mentioned in point 2, if Student is part of Organizing Committee or Participating a Competition at University/State/National/international Level then it will be considered as Internship else it will be considered as Activity Points.

@ As per AICTE, Students has to earn 100 Points by participating in 400 Hrs. of activities during 4 years of Engineering. After Completing 48 hrs. of Activities, Students can earn 12 Points. This Points will not be reflected in Grade Card. Separate transcript will be issued to students after completion of Final Year.

**S.E. Semester –IV (Computer Engineering)**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)**
**TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)**

| Course Description | | | Teaching Scheme (Program Specific) | | | | | Examination scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr. No. | Course Code | Course Title | Modes of Teaching / Learning / Weightage | | | | | Modes of Continuous Assessment / Evaluation | | | | |
| | | | Hours Per Week | | | | Credits | Theory (100) | | Practical/Oral (25) | Term Work (25) | Total |
| | | | Theory | Tutorial | Practical | Contact Hours | | IA(25) | ESE(75) | PR/OR | TW | |
| 1 | BSC-CS401 | Mathematics-IV | 3 | 1 | - | 4 | 4 | 25 | 75 | - | 25 | 125 |
| 2 | PCC- CS401 | Design & Analysis of Algorithms | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 3 | PCC- CS402 | Operating Systems | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 4 | PCC -CS403 | Computer Networks | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 5 | PCC-CS404 | Computer Graphics | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| | | **Total** | **15** | **1** | **8** | **24** | **20** | | | **Total marks** | | **725** |
| **Course Description** | | | **Non Credited Mandatory Course (Passing is mandatory for this course)** | | | | | | | | **Term Work** | |
| 1 | MC-CS401 | Value Education | 1 | - | - | 1 | (Non-Credit) | - | | | 25 | **25** |
| **Course Description** | | | **Contact Hrs. during Week End / Semester Break/ End of Semester(Between 21st and 25th Week)** | | | | | | | | **Term Work** | |
| **1** | SI-CS401 | Summer Internship | - | - | - | 160 * - 240* | 4 *- 6* | - | - | - | 50 | 50 |
| **Course Description** | | | **Contact Hrs. during Week End / Semester Break/ End of Semester (Between 21st and 25th Week) / During Semester** | | | | | | | | | |
| 1 | AP-CS401 | Activity Points | - | - | - | **52@** | - | - | - | - | - | - |
| **Course Description** | | | **Teaching scheme (Holistic Student Development -HSD) (Conducted in the beginning of Semester during first 3 Weeks)** | | | | | **Assessment/Evaluation Scheme** | | | | |
| | | | | | | | | **Presentation** | | **Report** | | **Term Work** |
| | | | | | | | | **AC** | | **AC** | | |
| 1 | ESD-CS401 | Employability Skill Development - II | - | - | 30 | 30 | 1 | Based on Parameters Decided by Training and Placement Cell | | | | 50 |
| 2 | HSD-CSPS401 | Professional Skills- IV (Introduction to Python) | 15 | - | 30 | 45 | 2 | 50 | | 25 | | 75 |
| 3 | HSD - CSPBL401 | Project Based Learning - II | - | - | 30 | 30 | 1 | 25 | | - | | 25 |
| 4 | HSD - CSABL401 | Activity Based Learning- IV (Co-curricular/Extra Curricular/Extension) | - | - | 30 | 30 | 1 | 25 | | 25 | | 50 |
| | | **Total** | **15** | **-** | **120** | **135** | **5** | | | **Total marks** | | **200** |
| | | **Total** | | | | | **29** | | | **Grand Total marks:** | | **1000** |

1. IA- In-Semester Assessment, ESE- End Semester Examination, PR- Practical Examination, TW – Term Work Examination, OR- Oral Examination, AC- Activity evaluation

* Students May go upto 240 hrs. to acquire maximum 6 credits. Students should collectively acquire total contact hrs in below given activities in a span of 1 year(3rd and 4 th Semester). Student will submit a report to earn Term work marks in internship at the end of 4th Semester.

Following Activities should be considered for Summer Internship:-

1) Participation in in-house internship at the end of 3rd and 4th semester of 2 week each.

2)Other Activity which also will be considered are: Participation in Hackathon, Development of new Product/ Business Plan / Registration of start-up, Participation in IPR workshop/Leadership talks/Idea/ Design / Innovation/Technical Expos, Internship with Industry / Govt. / NGO/ PSU/MSME/Online Internship, Long Term Goals under Rural Internship.

Note:- For Above Activities mentioned in point 2, if Student is part of Organizing Committee or Participating a Competition at University/State/National/international Level then it will be considered as Internship else it will be considered as Activity Points.

@ As per AICTE, Students has to earn 100 Points by participating in 400 Hrs. of activities during 4 years of Engineering. After Completing 52 hrs. of Activities, Students can earn 12 Points. This Points will not be reflected in Grade Card. Separate transcript will be issued to students after completion of Final Year.

**T.E. Semester –V (Computer Engineering)**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)**
**TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)**

| Course Description | | | Teaching Scheme (Program Specific) | | | | | Examination scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr. No. | Course Code | Course Title | Modes of Teaching / Learning / Weightage | | | | | Modes of Continuous Assessment / Evaluation | | | | |
| | | | Hours Per Week | | | | Credits | Theory (100) | | Practical/Oral (25) | Term Work (25) | Total |
| | | | Theory | Tutorial | Practical | Contact Hours | | IA(25) | ESE(75) | PR/OR | TW | |
| 1 | PCC-CS501 | Theory of Computer Science | 3 | 1 | - | 4 | 4 | 25 | 75 | - | 25 | 125 |
| 2 | PCC-CS502 | Introduction to Intelligent System | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 3 | PCC-CS503 | Software Engineering | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 4 | PCC-CS504 | Microprocessor | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 5 | PEC-CS501X | Professional Elective 1 | 3 | - | 2@ | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| | | **Total** | **15** | **1** | **8** | **24** | **20** | | | **Total marks** | | **725** |
| **Course Description** | | | **Non Credited Mandatory Course(Passing is mandatory for this course)** | | | | | | | | **Term Work** | |
| 1 | MC-CS501 | Indian Constitution | 1 | - | - | 1 | (Non-Credit) | - | | | 25 | **25** |
| **Course Description** | | | **Contact Hrs. during Semester Break/ End of Semester(Between 21st and 25th Week)** | | | | | | | | | |
| **1** | SI-CS501 | Summer Internship | - | - | - | 160 * - 240* | - | - | - | - | - | - |
| **Course Description** | | | **Contact Hrs. during Week End / Semester Break/ End of Semester (Between 21st and 25th Week) / During Semester** | | | | | | | | | |
| 1 | AP-CS501 | Activity Points | - | - | | **48#** | - | - | - | - | - | - |
| **Course Description** | | | **Teaching scheme (Holistic Student Development -HSD) (Conducted in the beginning of Semester during first 3 Weeks)** | | | | | **Assessment/Evaluation Scheme** | | | | |
| | | | | | | | | **Presentation** | | **Report** | | **Term Work** |
| | | | | | | | | **AC** | | **AC** | | |
| 1 | ESD-CS501 | Employability Skill Development - III | - | - | 30 | 30 | 1 | Based on Parameters Decided by Training and Placement Cell | | | | 50 |
| 2 | HSD - CSPS501 | Professional Skill V (Web Development) | 15 | - | 30 | 45 | 2 | 50 | | 25 | | 75 |
| 3 | HSD - CSPBL501 | Project Based Learning - III | - | - | 30 | 30 | 1 | 25 | | - | | 25 |
| 4 | HSD - CSRBL501 | Research Based Learning-I | - | - | 30 | 30 | 1 | 25 | | 25 | | 50 |
| | | **Total** | **15** | **-** | **120** | **135** | **5** | | | **Total marks** | | **200** |
| | | **Total** | | | | | **25** | | | **Grand Total marks:** | | **950** |

| PROFESSIONAL ELECTIVE I | | |
|---|---|---|
| **Course Code** | **Course name** | **Domain** |
| PEC-CS5011 | Advanced Operating Systems | 1 |
| PEC-CS5012 | Mobile Computing | 2 |
| PEC-CS5013 | Advanced Database Management System | 3 |
| PEC-CS5014 | Multimedia Systems | 4 |
| PEC-CS5015 | Machine Learning | 5 |

1. IA- In-Semester Assessment, ESE- End Semester Examination, PR- Practical Examination, TW – Term Work Examination, OR- Oral Examination, AC- Activity evaluation

2. @-Professional Elective Courses Lab will be conducted in the form of Capstone Project

***** This is part of Summer Internship but can start in winter. Students may go upto 240 hrs. to aquire maximum 6 credits in Semester 6
Total hrs. mentioned should be completed till end of Semester 6. Credits will be awarded at the end of 6th Semester and will be reflected in the Grade Card of 6th Semester.
Student will get 1 year span to acquire the credits. Students should collectively acquire total contact hrs in below given activities in a span of 1 year.
Student will submit a report to earn Term work marks in internship.

**Following activities should be considered for Summer Internship:-**

1) Participation in in-house internship at the end of 5th and 6th Semester of 2 week each.
2) Other activity which also will be considered are: Participation in Hackathon, Development of new Product/ Business Plan / Registration of start-up, Participation in IPR workshop/Leadership talks/Idea/ Design / Innovation/Technical Expos, Internship with Industry / Govt. / NGO/ PSU/MSME/Online Internship, Long Term Goals under Rural Internship.

Note:- For Above Activities mentioned in point 2, if Student is part of Organizing Committee or Participating a Competition at University/State/National/international Level then it will be considered as Internship else it will be considered as Activity Points.

# As per AICTE, Students has to earn 100 Points by participating in 400 Hrs. of activities during 4 years of Engineering. After Completing 48 hrs. of Activities, Students can earn 12 Points. This Points will not be reflected in Grade Card. Separate transcript will be issued to students after completion of Final Year.

## T.E. Semester –VI (Computer Engineering)

### Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)

### TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

| Course Description | | | Teaching Scheme (Program Specific) | | | | | Examination scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr. No. | Course Code | Course Title | Modes of Teaching / Learning / Weightage | | | | | Modes of Continuous Assessment / Evaluation | | | | |
| | | | Hours Per Week | | | | Credits | Theory (100) | | Practical/Oral (25) | Term Work (25) | Total |
| | | | Theory | Tutorial | Practical | Contact Hours | | IA(25) | ESE(75) | PR/OR | TW | |
| 1 | HSMC-CS601 | Soft Skill & Interpersonal Communication | 3 | - | - | 3 | 3 | 25 | 75 | - | - | 100 |
| 2 | PCC-CS601 | Cryptography & System Security | 3 | 1 | 2 | 6 | 5 | 25 | 75 | 25 | 25 | 150 |
| 3 | PCC-CS602 | System Programming & Compiler Construction | 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 4 | PEC-CS601X | Professional Elective II | 3 | - | 2@ | 5 | 4 | 25 | 75 | 25 | 25 | 150 |
| 5 | OEC-CS601X | Open Elective 1 | 3 | - | - | 3 | 3 | 25 | 75 | - | - | 100 |
| | | **Total** | **15** | **1** | **6** | **22** | **19** | - | - | **Total marks** | | **650** |
| **Course Description** | | | **Non Credited Mandatory Course (Passing is mandatory for this course)** | | | | | | | | **Term Work** | |
| 1 | MC-CS601 | Essence of Indian Knowledge Tradition | 1 | - | - | 1 | (Non-Credit) | - | | | 25 | **25** |
| **Course Description** | | | **Contact Hrs. during Semester Break/ End of Semester(Between 21st and 25th Week)** | | | | | | | | **Term Work** | |
| **1** | SI-CS601 | Summer Internship | - | - | - | 160 * - 240* | 4 *- 6* | - | - | - | 50 | **50** |
| **Course Description** | | | **Contact Hrs. during Week End / Semester Break/ End of Semester (Between 21st and 25th Week) / During Semester** | | | | | | | | | |
| 1 | AP-CS301 | Activity Points | - | - | | **52#** | - | - | - | - | - | - |
| **Course Description** | | | **Teaching scheme (Holistic Student Development -HSD ) (Conducted in the beginning of Semester during first 3 Weeks)** | | | | | **Assessment/Evaluation Scheme** | | | | |
| | | | | | | | | **Presentation** | | **Report** | | **Term Work** |
| | | | | | | | | **AC** | | **AC** | | |
| 1 | ESD-CS601 | Employability Skill Development - IV | - | - | 30 | 30 | 1 | Based on Parameters Decided by Training and Placement Cell | | | | 50 |
| 1 | HSD - CSPS601 | Professional Skill VI (Android App Development) | 15 | - | 30 | 45 | 2 | 50 | | 25 | | 75 |
| 2 | HSD - CSPBL601 | Project Based Learning-IV | - | - | 30 | 30 | 1 | 25 | | - | | 25 |
| 3 | HSD - CSRBL601 | Research Based Learning-II | - | - | 30 | 30 | 1 | 25 | | 25 | | 50 |
| | | **Total** | **15** | **-** | **120** | **135** | **5** | | | **Total marks** | | **200** |
| | | **Total** | | | | | **28** | | | **Grand Total marks:** | | **925** |

| PROFESSIONAL ELECTIVE II | | | OPEN ELECTIVE I | |
|---|---|---|---|---|
| **Course Code** | **Course name** | **Domain** | **Course Code** | **Course name** |
| PEC-CS6011 | Advanced Algorithm | 1 | OEC-CS6011 | Digital Marketing |
| PEC-CS6012 | Internet Programming | 2 | OEC-CS6012 | Entrepreneurship Development & Management |
| PEC-CS6013 | Data Warehousing & Mining | 3 | OEC-CS6013 | Software Process Automation |
| PEC-CS6014 | Digital Signal Processing | 4 | | |
| PEC-CS6015 | Soft Computing | 5 | | |

1. IA- In-Semester Assessment, ESE- End Semester Examination, PR- Practical Examination, TW – Term Work Examination, OR- Oral Examination, AC- Activity evaluation
2. @-Professional Elective Courses Lab will be conducted in the form Capstone Project

* Students may go upto 240 hrs. to aquire maximum 6 credits. Students should collectively acquire total contact hrs in above activities in a span of 1 year ($5^{th}$ and $6^{th}$ Semester). Student will submit a report to earn Term work marks in internship at the end of $6^{th}$ Semester.

Following activities should be considered for Summer Internship:-

1) Participation in inhouse internship at the end of $5^{th}$ and $6^{th}$ semester of 2 week each.
2)Other activity which also will be considered are: Participation in Hackathon, Development of new Product/ Business Plan / Registration of start-up, Participation in IPR workshop/Leadership talks/Idea/ Design / Innovation/Technical Expos, Internship with Industry / Govt. / NGO/ PSU/MSME/Online Internship, Long Term Goals under Rural Internship.

Note:- For Above Activities mentioned in point 2, if Student is part of Organizing Committee or Participating a Competition at University/State/National/international Level then it will be considered as Internship else it will be considered as Activity Points.

#As per AICTE, Students has to earn 100 Points by participating in 400 Hrs. of activities during 4 years of Engineering. After Completing 52 hrs. of Activities, Students can earn 12 Points. This Points will not be reflected in Grade Card. Separate transcript will be issued to students after completion of Final Year.

**B.E. Semester VII (Computer Engineering)**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)**

| Course Description | | | Teaching Scheme (Program Specific) | | | | | Examination scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr. No. | Course Code | Course Title | Modes of Teaching / Learning / Weightage | | | | | Modes of Continuous Assessment / Evaluation | | | | |
| | | | Hours Per Week | | | | Credits | Theory (100) | | Practical/Oral (25) | Term Work (25/50) | Total |
| | | | Theory | Tutorial | Practical | Contact Hours | | IA(20) | ESE(80) | PR/OR | TW | |
| 1 | CSC701 | Digital Signal & Image Processing | 4 | - | 2 | 6 | 5 | 20 | 80 | - | 25 | 125 |
| 2 | CSC702 | Mobile Communication & Computing | 4 | - | 2 | 6 | 5 | 20 | 80 | 25 | 25 | 150 |
| 3 | CSC703 | Artificial Intelligence & Soft Computing | 4 | - | 2 | 6 | 5 | 20 | 80 | 25 | 25 | 150 |
| 4 | CSDLO 701X | Department Level Optional Course -III | 4 | - | 2 | 6 | 5 | 20 | 80 | 25 | 25 | 150 |
| 5 | ILO701 X | Institute Level Optional Course-I | 3 | - | - | 3 | 3 | 20 | 80 | - | - | 100 |
| 6 | CSP701 | Major Project-I | - | - | 6 | 6 | 3 | - | - | 25 | 50 | 75 |
| | | **Total** | **19** | **-** | **14** | **33** | **26** | | | | **Total marks** | **750** |
| **Course Description** | | | **Teaching scheme (Holistic Student Development - HSD) Industry Specific/Interdisciplinary** | | | | | **Assessment/Evaluation Scheme** | | | | |
| 1 | HSD-CSPS701 | Professional Skill VII (Industry / Research /Entrepreneurship) | - | - | - | - | Audit | Non Scholastic Evaluation by Teacher Guardian Institute will issue certificate | | | | |
| 2 | HSD-CSRBL701 | Research Based Learning-III/Online/MOOCS | - | - | - | - | Audit | | | | | |
| | | **Total** | | | | **33** | **26** | | | | **Grand Total marks** | **750** |

| DEPARTMENT LEVEL OPTIONAL COURSE -III | | | INSTITUTE LEVEL OPTIONAL COURSE-I | |
|---|---|---|---|---|
| **Course Code** | **Course name** | **Domain** | **Course Code** | **Course name** |
| CSDLO7031 | Advance System Security & Digital Forensics | 1 | ILO7011 | Product Lifecycle Management |
| CSDLO7032 | Big Data & Analytics | 2 | ILO7012 | Reliability Engineering |
| CSDLO7033 | Robotics | 3 | ILO7013 | Management Information System |
| | | | ILO7014 | Design of Experiments |
| | | | ILO7015 | Operation Research |
| | | | ILO7016 | Cyber Security and Laws |
| | | | ILO7017 | Disaster Management & Mitigation Measures |
| | | | ILO7018 | Energy Audit and Management |
| | | | ILO7019 | Development Engineering |

1. IA- In-Semester Assessment, ESE- End Semester Examination, PR- Practical Examination, TW – Term Work Examination, OR- Oral Examination, AC- Activity evaluation
2. * The Laboratory Work (Experiments) for this course will be performed and evaluated as Computational Lab-I

## B.E. Semester VIII (Computer Engineering)

### Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)

| Course Description | | | Teaching Scheme (Program Specific) | | | | | Examination Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr. No. | Course Code | Course Title | Modes of Teaching / Learning / Weightage | | | | | Modes of Continuous Assessment / Evaluation | | | | |
| | | | Hours Per Week | | | | Credits | Theory (100) | | Practical/Oral (25/50) | Term Work (25/100) | Total |
| | | | Theory | Tutorial | Practical | Contact Hours | | IA(20) | ESE(80 | PR/OR | TW | |
| 1 | CSC801 | Human Machine Interaction | 4 | - | 2 | 6 | 5 | 20 | 80 | 25 | 25 | 150 |
| 2 | CSC802 | Distributed Computing | 4 | - | 2 | 6 | 5 | 20 | 80 | 25 | 25 | 150 |
| 3 | CSDLO 801X | Department Level Optional Course -IV | 4 | - | 2* | 6 | 5 | 20 | 80 | 25 | 50 | 175 |
| 4 | ILO801X | Institute Level Optional Course-II | 3 | - | - | 3 | 3 | 20 | 80 | - | - | 100 |
| 5 | CSL801 | Cloud Computing Lab | - | - | 4 | 4 | 2 | - | - | 25 | 50 | 75 |
| 6 | CSP802 | Major Project-II | - | - | 12 | 12 | 6 | - | - | 50 | 50 | 100 |
| | | **Total** | **15** | **-** | **22** | **37** | **26** | **Total marks** | | | | **750** |
| **Course Description** | | | **Teaching scheme (Holistic Student Development - HSD) (Industry Specific/Interdisciplinary)** | | | | | **Assessment/Evaluation Scheme** | | | | |
| 1 | HSD-CSPS801 | Professional Skill VIII( Industry / Research/Case Study/Entrepreneurship) ) | - | - | - | - | Audit | Non Scholastic Evaluation by Teacher Guardian and Institute will issue certificate | | | | |
| 2 | HSD-CSRBL801 | Research Based Learning-IV/Online/MOOCS | - | - | - | - | Audit | | | | | |
| | **Total** | | | | | **37** | **26** | **Grand Total marks** | | | | **750** |

| DEPARTMENT LEVEL OPTIONAL COURSE –IV | | INSTITUTE LEVEL OPTIONAL COURSE-II | |
|---|---|---|---|
| **Course Code** | **Course name** | **Course Code** | **Course name** |
| DLO8011 | High Performance Computing | ILO8021 | Project Management |
| DLO8012 | Natural Language Processing | ILO8022 | Finance Management |
| DLO8013 | Adhoc Wireless Networks | ILO8023 | Entrepreneurship Development and Management |
| | | ILO8024 | Human Resource Management |
| | | ILO8025 | Professional Ethics and CSR |
| | | ILO8026 | Research Methodology |
| | | ILO8027 | IPR and Patenting |
| | | ILO8028 | Digital Business Management |
| | | ILO8029 | Environmental Management |

1. IA- In-Semester Assessment, ESE- End Semester Examination, PR- Practical Examination, TW – Term Work Examination, OR- Oral Examination, AC- Activity evaluation
2. * The Laboratory Work (Experiments) for this course will be performed and evaluated as Computational Lab-I

**S.E. Semester –III**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **BE (Computer Engineering)** | | | | | | | **SEM:** III | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Mathematics-III | | | | | | | **Course Code:** BSC-CS301 | | | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | | **Term Work (25)** | | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **MSE** | **SEE** | **MSE** | **SEE** | **MSE** | **SEE** | |
| 3 | 1 | - | 4 | 4 | 25 | 75 | - | - | 10 | 15 | **125** |
| **MSE:** Mid Semester Examination- Paper Duration - **1.5 Hours**<br>**SEE:** Semester End Examination - Paper Duration - **3 Hours**<br>Mid Semester Assessment for Term work will be on continuous basis | | | | | | | | | | | |
| **Prerequisite:** Basic Mathematics | | | | | | | | | | | |

**Course Objectives:** The objective of the course is to understand the discrete mathematical preliminaries and apply the knowledge of sets, relations, functions, graphs, lattices and transform calculus in formal representation of various computing constructs.

**Outcomes:** Students will be able to:

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the basic concepts of set theory and able to apply basic set operations in problem solving. | L1, L2, L3 |
| 2 | Understand relation and function and their properties and also able to understand their use in programming applications. | L2, L3 |
| 3 | Understand Partially ordered set, lattice concept in various application. | L1, L2, L3 |
| 4 | Understand the concept of graph, Euler graph, Hamiltonian graph and special kind of graph and also able to model real world problems using graph theory. | L1, L3 |
| 5 | Apply the Laplace Transform, Inverse Laplace Transform and its properties to solve ODE. | L1, L2, L3 |
| 6 | Apply the concept of Fourier Transform and Inverse Fourier transform through properties. | L1, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Set Theory and Proofing Techniques**<br>Definition of Sets, Venn Diagrams, complements, cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets)<br>Laws of set theory, Power set and Products Partitions of sets. The Principle of Inclusion and Exclusion Pigeonhole Principle | 6 | L1, L2, L3 |
| 2 | **Relation and Functions**<br>Relation: Definition, types of relation, composition of relations, pictorial representation of relation (Digraphs), properties of relation, partial ordering relation. Operations on relations, Closures, Warshall's algorithm.<br>Function: Definition and types of function, composition of functions. | 7 | L2, L3 |
| 3 | **Lattices**<br>Posets, Hasse Diagram, chain , Upper bounds, Lower bounds, GLB & LUB of sets, Definition & properties of Lattice, sublattice Distributive& modular Lattices, complemented & bounded Lattices , Complete lattices. | 7 | L1, L2, L3 |
| 4 | **Graph Theory**<br>Definitions: graphs, digraphs, Multigraphs, Paths and cycles (Hamiltonian and Eulerian), Subgraphs, Isomorphism, Special kinds of graphs: bipartite graphs, planer graphs. | 8 | L1, L3 |
| 5 | **Transform Calculus -I**<br>Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions, Finding inverse Laplace transform by different methods | 8 | L1, L2, L3 |
| 6 | **Transform Calculus -II**<br>Convolution theorem, Solving ODEs by Laplace Transform method, Fourier Transform and Inverse Fourier transform of constant and exponential function, Properties of Fourier Transform | 9 | L1, L3 |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Elements of Discrete Mathematics | C. L. Liu and D. P. Mohapatra | McGraw Hill | 2nd Edition | 2010 |
| 2 | Discrete Mathematical Structures with Applications to Computer Science | J. P. Trembley, R. Manohar | McGraw Hill | 5th Edition | 2011 |
| 3 | Discrete Mathematics | Seymour Lipschutz, Marc Lars Lipson," | McGraw Hill | 5th Edition | 2010 |
| 4 | Advanced Engineering Mathematics | Erwin kreyszig | John Wiley & Sons | Ninth Edition | 2006 |
| 5 | Higher Engineering Mathematics | B.S. Grewal | Khanna Publishers | Thirty Sixth Edition | 2010 |

## List of Tutorials:

| Sr. No | Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Tutorial on Set theory | 1 | L1, L2 |
| 2 | Tutorial on Principle of Inclusion and Exclusion | 1 | L1, L2, L3 |
| 3 | Tutorial on Pigeonhole Principle | 1 | L1, L2, L3 |
| 4 | Tutorial on Relation | 1 | L1, L2 |
| 5 | Tutorial on Warshall's Algorithm | 1 | L1, L2, L3 |
| 6 | Tutorial on Functions | 1 | L1, L2 |
| 7 | Tutorial on isomorphism | 1 | L1, L2, L3 |
| 8 | Tutorial on poset, Hasse diagram | 1 | L1, L2 |
| 9 | Tutorial on Lattice, Sublattice | 1 | L1, L2, L3 |
| 10 | Tutorial on types of lattice | 1 | L1, L2, L3 |
| 11 | Tutorial on planar graphs | 1 | L1, L2 |
| 12 | Tutorial on Eulerian and Hamiltonian Graphs | 1 | L1, L2, L3 |
| 13 | Tutorial on Laplace Transform | 1 | L1, L2 |
| 14 | Tutorial on Inverse Laplace Transform | 1 | L1, L2, L3 |
| 15 | Tutorial on Fourier Transform | 1 | L1, L2, L3 |
| | **Total Hours** | **15** | |

**S.E. Semester –III**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

| **B.E. ( Computer Engineering )** | | | | | | | **S.E. SEM : III** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :** Data Structures | | | | | | | **Course Code :**PCC- CS301 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | **150** |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Computer Basics, Procedural Programming Languages | | | | | | | | | |

**Course Objective:** The course intends to deliver the fundamentals of data structures by providing a platform to learn, compare and apply them in real world scenario.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Compare linear and non-linear data structures. | L1, L2 |
| 2 | Apply operations like insertion, deletion, searching and traversing on stack and queue data structure. | L1, L2, L3 |
| 3 | Apply operations like insertion, deletion, searching and traversing on linked list data structure. | L1, L2, L3 |
| 4 | Apply operations like insertion, deletion, searching and traversing on tree data structure. | L1, L2, L3 |
| 5 | Apply operations like insertion, deletion, searching and traversing on graph data structure. | L1, L2, L3 |
| 6 | Analyze appropriate sorting and searching technique for given problem. | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Data Structure** | 3 | L1, L2 |
| | Introduction, Types of data Structures, Abstract data type, Operations on data structures. | | |
| 2 | **Stacks and Queues** | 7 | L1, L2, L3 |
| | **Stack**: ADT of stack, operations on stack, array implementation of stack, applications of stack.<br>**Queue:** ADT of queue, operations on queue, array implementation of queue, Types of queues: circular queue, priority queue, double ended queue, applications of queue. | | |
| 3 | **Linked lists** | 8 | L1, L2, L3 |
| | **Linked list**: ADT of Linked lists, operations on linked list, Types of linked lists: Single linked list, Double Linked list, Implementation of linked list, stack implementation using linked list, queue implementation using linked list, Applications of linked list. | | |
| 4 | **Introduction to Non Linear Data Structure** | 13 | L1, L2, L3 |
| | **Trees:** Terminologies, Binary tree and its types, Binary tree operations and implementation, Tree traversing techniques,<br>Expression tree, AVL tree, Multiway search tree, Application of tree. | | |
| 5 | **Graphs** | 6 | L1, L2, L3 |
| | **Graph:** Terminologies, Graph representation: Matrix and Adjacency list, Graph traversing techniques: BFS, DFS, Applications of graph. | | |
| 6 | **Searching and Sorting** | 8 | L1, L2, L3, L4 |
| | **Searching:** Linear search, binary search<br>**Sorting:** Insertion sort, Merge sort, Quick sort<br>**Hashing:** Hash functions, Hash table, Hashing technique, Collision resolution technique | | |
| | **Total Hours** | **45** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Data Structures using C | Reema Thareja | Oxford | Second Edition | 2014 |
| 2 | Data Structures: A Pseudocode Approach with C | Richard F. Gilberg & Behrouz A., Forouzan | CENGAGE Learning | Second Edition | 2011 |
| 3 | Data Structures Using C | Aaron M Tenenbaum, Yedidyah Langsam, Moshe J Augenstein | Pearson | Second Edition | 2006 |
| 4 | Data Structures with C | Seymore Lipschutz | Tata McGraw-Hill | India Special Edition | 2011 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.geeksforgeeks.org | https://www.geeksforgeeks.org/stack-data-structure/ | M1-M6 |
| 2 | www.studytonight.com | https://www.studytonight.com/data-structures/introduction-to-data-structures | M1-M3, M6 |
| 3 | www.w3schools.in | https://www.w3schools.in/category/data-structures-tutorial/ | M1-M4, M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Build a Program for stack using an array (Menu driven program) | 2 | L1, L2, L3 |
| 2 | | Build a Program for Queue using an array. (Menu driven program) | 2 | L1, L2, L3 |
| 3 | **Design Experiments** | Develop a code for circular queue. (Menu driven) | 2 | L1, L2, L3 |
| 4 | | Develop a code for Single Linked List. (Menu driven program) | 2 | L1, L2, L3 |
| 5 | | Develop a code for Doubly linked list. (Menu driven program) | 2 | L1, L2, L3 |
| 6 | | Develop a code for Binary Search Tree (Menu driven program) | 2 | L1, L2, L3 |
| 7 | | Develop a code for BFS. (Menu driven program) | 2 | L1, L2, L3 |
| 8 | | Develop a code for DFS. (Menu driven program) | 2 | L1, L2, L3 |
| 9 | | Develop a code for Binary search technique. | 2 | L1, L2, L3 |
| 10 | | Develop a code for Quick Sort. | 2 | L1, L2, L3 |
| 11 | **Advanced Experiments** | Develop a code for circularly linked doubly linked list. | 2 | L1, L2, L3 |
| 12 | | Develop a code for Hashing technique with collision resolution. | 2 | L1, L2, L3 |
| 13 | **Mini/Minor Projects/ Seminar/ Case Studies** | **Case study:**<br>1. Red-Black tree<br>2. Binomial heap<br>**Mini Project:**<br>1. Build a Snakes & Ladders game<br>2. Sudoku Solver<br>3. Maze generator<br>4. Dictionary implementation<br>5. Employee Record System<br>6. Super market Billing System | 6 | L1, L2, L3, L4 |
| | | **Total Hours** | **30** | |

**S.E. Semester –III**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

| **B.E. ( Computer Engineering )** | | | | | | | **S.E. SEM : III** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :** Database Management System | | | | | | | Course Code : PCC- CS302 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination scheme** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Computer Basics | | | | | | | | | |

**Course Objective:** The course intends to deliver the fundamental knowledge of database management system and apply this knowledge for implementing and analyzing real world problems.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Objectives | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Demonstrate the fundamental elements of relational database Management Systems | L1, L2 |
| 2 | Outline ER and EER diagram for the real life problem and convert it to Relational Database. | L1, L2,L3 |
| 3 | Solve and build basic SQL Queries on given Data. | L1, L2, L3 |
| 4 | Solve and build Advanced SQL Queries on given Data. | L1, L2, L3 |
| 5 | Develop a relational database using concept of functional dependencies. | L1, L2, L3 |
| 6 | Interpret the concepts of transaction, concurrency and recovery | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Database Concepts**<br>Basic Concepts of Data, Database and DBMS, Applications of Databases, Advantages of Databases over File Processing System, 3 Level Architecture of Database System, Data Abstraction and Data Independence, Database Languages, Database Users, Database Administrator and its functions, Overall System Structure. | 3 | L1, L2 |
| 2 | **Entity Relationship Model(ER), Relational Model and Extended ER Model** | 6 | |

| | | | |
|---|---|---|---|
| | **The Entity-Relationship (ER) Model:** Entity with its types, Attributes with its types, Relationships with its Types. Real life Examples of ER Diagram.<br>**Relational Model**: Structure of Relational Databases, Keys with its Types<br>**Extended ER Model (EER):** Concept ofSpecialization**,** Generalization and Aggregation, Mapping of ER and EER to Relational Model. | | L1, L2,L3 |
| 3 | **Introduction to Structured Query Language (SQL)**<br>Overview of SQL, Data Definition Language Commands, Data Manipulation Language Commands, Data Control Language Commands, Transaction Control Language Commands, Constraints, Set and String Operations, Aggregate Functions, Group by and Having Clause. | 9 | L1, L2, L3 |
| 4 | **Advanced SQL with Integrity, Security and Authorization**<br>Nested Sub queries, Referential Integrity in SQL, Joins, Views, Assertion, Trigger, Database Security and Authorization, Granting of Privileges, Revoking of Authorization in SQL<br>**Relational Algebra:** Fundamental Operations in Relational Algebra | 11 | L1, L2, L3 |
| 5 | **Relational Database Design**<br>Pitfalls in Relational Database Design, Concept of Normalization, Functional Dependencies, 1 NF, 2 NF, 3 NF, BCNF, 4 NF | 8 | L1, L2, L3 |
| 6 | **Transaction, Recovery and Concurrency Control**<br>**Transaction Management:**Transaction Concept, Transaction States, ACID Properties of Transaction, Serial and Concurrent Executions, Conflict and View Serializability.<br>**Concurrency Control:** Lock Based Protocols, Deadlock Handling<br>**Recovery:** Failure Classification, Log based recovery, Checkpoint, Shadow Paging. | 8 | L1, L2 |
| | **TotalHours** | **45** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Database System Concepts | Korth, Slberchatz,Sudarshan | McGraw Hill | Seventh Edition | 2019 |
| 2 | Fundamentals of Database Systems | Elmasri and Navathe | Pearson education | Seventh Edition | 2016 |
| 3 | Database Management Systems | Raghu Ramkrishnan and Johannes Gehrke | McGraw Hill | Third Edition | 2014 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.guru99.com | https://www.guru99.com/dbms-tutorial.html | M1,M2,M6 |
| 2 | www.javatpoint.com | https://www.javatpoint.com/dbms-tutorial | M1-M6 |
| 3 | www.studytonight.com | https://www.studytonight.com/dbms/ | M1 to M3,M5 |
| 4 | www.w3schools.in | https://www.w3schools.in/dbms/<br>https://www.w3schools.com/sql/default.asp | M1,M2,M5,M6<br>M3,M4 |
| 5 | www.geeksforgeeks.org | https://www.geeksforgeeks.org/dbms/ | M1- M6 |
| 6 | www.tutorialcup.com | https://www.tutorialcup.com/dbms | M1, M2, M5,M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Identify any real life Database Management System. Identify Entity, Relationship and Attributes with its types for Identified Real life Example | 2 | L1, L2 |
| 2 | **Design Experiments** | Develop an Entity-Relationship (ER) diagram for the problem definition Identified and convert it into Relational Database. | 2 | L1, L2, L3 |
| 3 | | Apply DDL Commands to Specified System | 2 | L1, L2, L3 |
| 4 | | Apply Basic DML Commands to Specified System | 2 | L1, L2, L3 |
| 5 | | Apply Constraints for the Specified system. | 2 | L1, L2, L3 |
| 6 | | Apply Set and String Operations to Specified System | 2 | L1, L2, L3 |
| 7 | | Apply Aggregate Functions and Create Views for Specified System | 2 | L1, L2, L3 |
| 8 | | Build Nested Queries on Specified System. | 2 | L1, L2, L3 |
| 9 | | Apply Referential Integrity on Specified System. | 2 | L1, L2, L3 |
| 10 | | Develop of Normalized Database for any Real World Example by applying concept of Normalization | 2 | L1, L2, L3 |
| 11 | **Advanced Experiments** | Apply Triggers in SQL for Specified System | 2 | L1, L2, L3 |
| 12 | | Apply Joins in SQL for Specified System | 2 | L1, L2, L3 |
| 13 | **Mini/Minor Projects/ Seminar/ Case Studies** | 1. Student Management System<br>2. Library Management System<br>3. Airline Reservation System<br>4. Hospital Management System<br>5. Hotel Management System<br>6. Billing System | 6 | L1, L2, L3 |
| | | **Total Hours** | **30** | |

**S.E. Semester –III**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. ( Computer Engineering )** | | | | | | | **S.E. SEM : III** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Digital Logic Design & Analysis | | | | | | | **Course Code:** PCC-CS303 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | **150** |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Engineering Mathematics | | | | | | | | | |

**Course Objective:** The course intends to provide the basic knowledge of digital logic levels and apply knowledge to understand digital electronics circuits.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Build different number systems forms | L1, L2, L3 |
| 2 | Solve Boolean expressions | L1, L2, L3 |
| 3 | Explain the basics of TTL and CMOS logic families | L1, L2 |
| 4 | Illustrate the design of Combinational circuits | L1, L2,L3 |
| 5 | Illustrate the design of Sequential circuits | L1, L2,L3 |
| 6 | Understand the concepts in designing of counters and registers | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Number Systems and codes** | 8 | L1, L2, L3 |
| | **Introduction to number system and conversions:** Binary, Octal, Decimal and Hexadecimal number Systems, Binary arithmetic: addition, subtraction (1"s and 2"s complement), multiplication and division. Octal and Hexadecimal arithmetic: Addition and Subtraction (7"s and 8"s complement method for octal) and (15"s and 16"s complement method for Hexadecimal). **Codes:** Gray Code, BCD Code, Excess-3 code, ASCII Code. **Error Detection and Correction:** Hamming codes. | | |
| 2 | **Boolean Algebra & Logic Gates** | 7 | L1, L2, L3 |
| | Theorems and Properties of Boolean Algebra, Boolean functions, Boolean function reduction using Boolean laws, Canonical forms, Standard SOP and POS form. **Basic Digital gates:** NOT , AND , OR , NAND , NOR , EXOR , EXNOR, positive and negative logic, K-map method 2 variable, 3 variable, 4 variable, Don't care condition, Quine-McClusky Method, NAND, NOR Realization. | | |
| 3 | **Digital Logic Families** | 3 | L1, L2 |
| | Introduction: Terminologies like Propagation Delay, Power Consumption, Fan in and Fan out, current and voltage parameters, noise margin, with respect to TTL and CMOS Logic and their comparison | | |
| 4 | **Analysis and Design of Combinational Logic** | 9 | L1, L2, L3 |
| | Introduction, Half and Full Adder, Half subtractor and Full Subtractor, One digit BCD Adder, Multiplexer, Multiplexer tree, Demultiplexer, Demultiplexer tree, Encoders Priority encoder, Decoders, One bit, Two bit, 4-bit Magnitude Comparator, ALU IC 74181. | | |
| 5 | **Latches and Flip Flops** | 9 | L1, L2, L3 |
| | Introduction: SR latch, Concepts of Flip Flops: SR, D, J-K, T, Truth Tables and Excitation Tables of all types, Race around condition, Master Slave J-K Flip Flops, Timing Diagram, Flip-flop conversion, State machines, state diagrams, State table, concept of Moore and Mealy machine | | |
| 6 | **Counters and Shift registers** | 9 | L1, L2, L3 |
| | Counters: Design of Asynchronous and Synchronous Counters, Modulus of the Counters, UP- DOWN counter. Shift Registers: SISO, SIPO, PIPO, PISO Bidirectional Shift Register, Universal Shift Register, Ring and twisted ring/Johnson Counter, sequence generator. | | |
| | **Total Hours** | **45** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Modern Digital Electronics | R. P. Jain | McGraw Hill | Fourth Edition | 2010 |
| 2 | Digital Logic and computer Design | M. Morris Mano | Pearson | Sixth Edition | 2017 |
| 3 | Digital Principles and Applications | Donald p Leach, Albert Paul Malvino | McGraw Hill | Seventh Edition | 2011 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.crectirupati.com | http://www.crectirupati.com/sites/default/files/lecture_notes/DLD%20lecture%20notes.pdf | M11-M2, M4-M6 |
| 2 | www.engrcs.com | https://www.engrcs.com/courses/engr250/engr250lecture.pdf | M1-M6 |
| 3 | www.uptusuccess.com | https://uptusuccess.com/digital-logic-design-rec301/ | M1-M3 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | Basic Experiments | Utilize logic gates to realize Boolean expressions | 2 | L1, L2, L3 |
| 2 | | Make use of universal gates to implement Basic gates | 2 | L1, L2, L3 |
| 3 | | Build parity generator and detector. | 2 | L1, L2, L3 |
| 4 | Design Experiments | Build basic gates using Xilinx. | 2 | L1, L2, L3 |
| 5 | | Build binary to gray code and gray code to binary converter | 2 | L1, L2, L3 |
| 6 | | Construct arithmetic circuits i) Half adder ii) Full adder iii) Half subtractor iv) Full subtractor. | 2 | L1, L2, L3 |
| 7 | | Construct 4:1 multiplexer using Xilinx. | 2 | L1, L2, L3 |
| 8 | | Develop full adder using multiplexer IC | 2 | L1, L2, L3 |
| 9 | | Develop 4 bit binary adder using IC 7483 | 2 | L1, L2, L3 |
| 10 | | Develop full adder using multiplexer IC | 2 | L1, L2, L3 |
| 11 | | Construction of 2-bit magnitude Comparator. | 2 | L1, L2, L3 |
| 12 | | Make use of NAND and NOR gates to Verify state tables of R-S flip-flop, J - K flip-flop, T Flip-Flop, D Flip-Flop | 2 | L1, L2, L3 |

| | | | | |
|---|---|---|---|---|
| 13 | **Mini/Minor Projects/ Seminar/ Case Studies** | 1. Water Level Indicator<br>2. Rain Alarm Circuit<br>3. RFID based Attendance System<br>4. PC Based Digital IC Tester<br>5. K-map using 5 Variables<br>6. Very High Speed Integrated Circuit Hardware Description Language | 6 | L1, L2, L3 |
| | | **Total Hours** | **30** | |

**S.E. Semester –III**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E.( Computer Engineering )</td><td colspan="4">S.E. SEM : III</td></tr>
<tr><td colspan="7">Course Name: Computer Organization & Architecture</td><td colspan="4">Course Code: PCC-CS304</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>3</td><td>-</td><td>2</td><td>5</td><td>4</td><td>25</td><td>75</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Basic Mathematics</td></tr>
</table>

**Course Objective:** This course intends to deliver basics of modern computer organization and architectures, covering the interaction between computer hardware and software at various levels and to analyze performance issues in processor and memory design of a digital computer.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Explain basic structure and working of computer. | L1, L2 |
| 2 | Apply various computer arithmetic operations. | L1, L2, L3 |
| 3 | Explain the working of control unit. | L1, L2 |
| 4 | Understand various types of memory of digital computer. | L1, L2, L3 |
| 5 | Compare between different types I/O modes of transfer. | L1, L2 |
| 6 | Understand basic concepts of pipelining. | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction of Computer Organization and Architecture**<br>Basic organization of computer and block level description of the functional units. Introduction to computer organization & Architecture, Evolution of Computers, Von Neumann model, Instruction cycle, Addressing Modes, Instruction Format, Introduction to System buses, Multi-bus organization. | 5 | L1, L2 |
| 2 | **Data Representation and Arithmetic Algorithm**<br>Signed number representation, fixed point computation algorithms, Booth multiplication, Division - non-restoring and restoring techniques, floating point arithmetic algorithms. IEEE 754 floating point number representation. | 7 | L1, L2, L3 |
| 3 | **Control Unit Design**<br>Control Unit: Soft wired (Micro-programmed) and Hardwired control unit design methods, Address sequencing, Microprogram Sequencer, Micro operation, Micro instruction Format, Control Memory, Concepts of nano programming, Introduction to RISC and CISC architectures and design issues. | 6 | L1, L2 |
| 4 | **Memory Organization**<br>Classifications of primary and secondary memories, Types of RAM and ROM, Memory hierarchy and characteristics. Memory Access Methods. Cache memory: concept, architecture, mapping, Cache coherency, Interleaved and Associative memory, Memory management unit, Magnetic Hard disks. | 9 | L1, L2 |
| 5 | **I/O Organization**<br>Input/ Output systems, Types of data transfer techniques: Programmed I/O, Interrupt driven ,Direct Memory Access and DMA controller, Types of Interrupts, Bus Arbitration, Interface circuits - Parallel and serial port. Features of PCI and PCI Express bus. | 9 | L1, L2 |
| 6 | **Pipelining & Parallel Processing**<br>Introduction to pipelining, Performance measures of pipelining, Synchronous and Asynchronous pipelining, Instruction level pipelining (ILP), Pipelining hazards, Handling of Branch instructions. Multiprocessor (loosely & tightly coupled) and Multicomputer (UNA, NUMA, COMA). | 9 | L1, L2 |
| | **Total Hours** | **45** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Computer organization | V. Carl, G. Zvonko and S. G. Zaky | McGraw Hill | Sixth Edition | 2011 |
| 2 | Computer Architecture and Organization | Morris Mano | McGraw Hill | Third Edition | 2010 |
| 3 | Computer Organizations and Architecture | John P. Hayes | McGraw-Hill | Fifth Edition | 2017 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.nptel.ac.in | https://nptel.ac.in/courses/106102062/ | M1-M6 |
| 2 | www.edx.org | https://www.edx.org/course/computation-structures-2-computer-architecture | M1-M6 |
| 3 | www.coursera.org | https://www.coursera.org/learn/comparch | M1-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | Basic Experiments | Demonstrate Computer Anatomy- Memory, Ports, Motherboard and add-on cards. | 2 | L1, L2 |
| 2 | | Develop a program to calculate 1's compliment and 2's compliment of a Binary number. | 2 | L1, L2, L3 |
| 3 | | Develop a program to calculate Binary and octal addition and multiplication | 2 | L1, L2, L3 |
| 4 | Design Experiments | Construct of Register and Counter | 2 | L1, L2, L3 |
| 5 | | Develop a program to convert in IEEE 754 format | 2 | L1, L2, L3 |
| 6 | | Develop a program to perform Booth's Multiplication on binary numbers | 2 | L1, L2, L3 |
| 7 | | Develop a C/Java program for Non-restoring Division | 2 | L1, L2, L3 |
| 8 | | Develop a C/Java program for Restoring Division | 2 | L1, L2, L3 |
| 9 | | Experiment with mapping techniques of Direct Mapped Cache memory. | 2 | L1, L2, L3 |

| | | | | |
|---|---|---|---|---|
| 10 | | Experiment with mapping techniques of Cache memory, Associative Mapped cache, Set Associative Mapped cache | 2 | L1, L2, L3 |
| 11 | | Build a program to compare the performance measures of pipelined and non-pipelined systems. | 2 | L1, L2, L3 |
| 12 | | Build a C/Java program for Interrupt Handling | 2 | L1, L2, L3 |
| 13 | **Mini/Minor Projects/ Seminar/ Case Studies** | 1. Case Study: A Recent Intel Processor<br>2. Parallel Architectures<br>3. Bus Arbitration<br>4. Direct Memory Access<br>5. Cache Mapping<br>6. Nano Programming | 6 | L1, L2, L3 |
| | | **Total Hours** | **30** | |

**S.E. Semester –III**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">S.E. SEM : III</td></tr>
<tr><td colspan="7">Course Name : Environmental Studies</td><td colspan="4">Course Code :MC-CS301</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">25</td></tr>
<tr><td>1</td><td>-</td><td>-</td><td>1</td><td>(Non Credit)</td><td>-</td><td>-</td><td>-</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Biology, chemistry, geography, geology, physics.</td></tr>
</table>

## Course Objective:

The course intends to deliver the fundamental concepts of Environmental Sciences. It will also help in understanding & analyzing the major challenges and current issues in Environment and evaluate possible solutions.

## Course Outcome: Upon completion of the course students will be able to:

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Relate the concept of Environmental Sciences and provide solutions to the major challenges and current issues in Environment. | L1, L2 |
| 2 | Relate the fundamentals and importance of Natural Resources and understand the importance of Biodiversity and its Conservation. | L1, L2 |
| 3 | Interpret and Analyze various types of Environmental Pollution and their effects on plants and animals | L1, L2, L3, L4 |
| 4 | Relate and Apply various laws available in the country to protect the Environment. | L1, L2, L3 |
| 5 | Interpret and Analyze address social issues for sustainable development. | L1, L2, L3, L4 |
| 6 | Relate and Analyze the importance of Environmental Monitoring. | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Concepts of Environmental Sciences**<br>Environment, Levels of organizations in environment, Structure and functions in an ecosystem; Biosphere, its Origin and distribution on land in water and in air. | 2 | L1, L2 |
| 2 | **Natural Resources, Biodiversity and its conservation**<br>Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative), Biodiversity at global, national and local levels; India as a mega-diversity nation; and strategies for conservation of Biodiversity. | 3 | L1, L2 |
| 3 | **Environmental Pollution**<br>Types of pollution- Air, water (including urban, rural, marine), soil, noise, thermal, nuclear; Pollution prevention; Management of pollution- Rural/Urban/Industrial waste management [with case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar], Solid/Liquid waste management, disaster management. | 3 | L1, L2, L3, L4 |
| 4 | **Environmental Biotechnology**<br>Biotechnology for environmental protection- Biological indicators, bio- sensors; Remedial measures- Bio-remediation, photo remediation, bio-pesticides, bio-fertilizers; Bio-reactors- Design and application | 2 | L1, L2, L3 |
| 5 | **Social Issues and Environment**<br>Problems relating to urban environment- Population pressure, water scarcity, industrialization; remedial measures; Climate change- Reasons, effects (global warming, ozone layer depletion, acid rain) with one case study; Legal issues- Environmental legislation (Acts and issues involved), Environmental ethics | 3 | L1, L2, L3, L4 |
| 6 | **Environmental Monitoring**<br>Monitoring- Identification of environmental problem, tools for monitoring (remote sensing, GIS); Sampling strategies- Air, water, soil sampling Techniques | 2 | L1, L2, L3, L4 |
| | **Total Hours** | **15** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Textbook of Environmental Studies for Undergraduate Courses | Erach Bharucha | University's Press | Second Edition | 2013 |
| 2 | Fundamentals of Environmental Studies | Mahua Basu& Xavier Savarimuthu SJ | Cambridge Publication | First Edition | 2016 |
| 3 | Environmental Studies | Benny Joseph | Tata McGraw – Hill Publishing Company Limited | First Edition | 2015 |
| 4 | Environmental Studies | R.J.Ranjit Daniels, Jagadish Krishnaswamy | Wiley India Private Ltd., New Delhi. | First Edition | 2013 |
| 5 | Introduction to Environmental Engineering and Science | Gilbert M. Masters | Pearson- Education | Third Edition | 2008 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1. | www.conserve-energy-future.com | https://www.conserve-energy-future.com/what-is-environmental-science-and-its-components.php | M1 |
| 2. | www.vikaspedia.in/InDG | http://vikaspedia.in/energy/environment/biodiversity-1/conservation-of-biodiversity | M2 |
| 3. | www.encyclopedia.com | https://www.encyclopedia.com/earth-and-environment/ecology-and-environmentalism/environmental-studies/environmental-toxicology | M3 |
| 4. | www.environmentalscience.org | https://www.environmentalscience.org/career/environmental-biotechnology | M4 |
| 5. | www.forestresearch.gov.uk | https://www.forestresearch.gov.uk/tools-and-resources/urban-regeneration-and-greenspace-partnership/greenspace-in-practice/practical-considerations-and-challenges-to-greenspace/social-and-environmental-justice/ | M5 |
| 6. | www.unece.org/info/ece-homepage.html | https://www.unece.org/environmental-policy/environmental-monitoring-and-assessment/areas-of-work/environmental-monitoring.html | M6 |

## List of Practical/ Experiments: NA

**S.E. Semester –III**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **S.E. SEM: III** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Summer Internship | | | | | | | **Course Code:** SI-CS301 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | - |
| - | - | - | 160*-240* | - | - | - | - | - | |
| **IA: In-Semester Assessment**<br>**ESE: End Semester Examination** | | | | | | | | | |
| **Prerequisite:** Mathematical Foundation, Computing Methods | | | | | | | | | |

**Course Objective:** To familiarize students with emerging technologies used in industry. Also, to expose the students with developments in the various Program Specific Research (PSR) domains offered by the department.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | To comprehend the different emerging technologies used in the industry | L1, L2 |
| 2 | To apply different emerging technologies for solving the problems in the domains. | L1, L2,L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Computing and System Design domain**<br>• Seminar on Emerging Technologies used in the industry<br>• Hands-on Workshop on Industry special skills<br>• Industry Connect / Alumni Connect Seminar | 5 | L1, L2, L3 |
| 2 | **Communication Networking and Web Engineering domain**<br>• Seminar on Emerging Technologies used in the industry<br>• Hands-on Workshop on Industry special skills<br>• Industry Connect / Alumni Connect Seminar | 5 | L1, L2, L3 |
| 3 | **Multimedia System Design and Development domain**<br>• Seminar on Emerging Technologies used in the industry<br>• Hands-on Workshop on Industry special skills<br>• Industry Connect / Alumni Connect Seminar | 5 | L1, L2, L3 |

| | | | |
|---|---|---|---|
| 4 | **Software Development and Information Management System domain**<br>• Seminar on Emerging Technologies used in the industry<br>• Hands-on Workshop on Industry special skills<br>• Industry Connect / Alumni Connect Seminar | 5 | L1, L2, L3 |
| 5 | **Intelligent System Design and Development**<br>• Seminar on Emerging Technologies used in the industry<br>• Hands-on Workshop on Industry special skills<br>• Industry Connect / Alumni Connect Seminar | 5 | L1, L2, L3 |
| 6 | **Case study on the Emerging Tools and techniques under Program Specific Research domains** | 5 | L1, L2, L3 |
| | **Total Hours** | **30** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Emerging Technologies in Computer Science: Introducing The New IT & The Internet of Things | Andrew Moss | Amazon | I | 2019 |
| 2 | Emerging Technologies in Computing | Miraz, M.H., Excell, P., Ware, A., Soomro, S., Ali, M. | Springer | I | 2018 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | Advanced Topics in Computer Science | http://m.el-dosuky.com/course.php?c=advanced-topics-in-computer-science | M1-M6 |
| 2 | https://interestingengineering.com | https://interestingengineering.com/5-technology-trends-to-watch-in-2019 | M1-M6 |

**S.E. Semester –III**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. ( Computer Engineering )** | | | | | | | **S.E. SEM : III** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :** Professional Skills-III (Object Oriented Programming using Java) | | | | | | | **Course Code :**HSD-CSPS301 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Conducted in the beginning of Semester during first 3 Weeks** | | | | | **Theory (100)** | | **Presentation (25)** | **Report (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **(AC)** | **(AC)** | |
| 15 | - | 30 | 45 | 2 | - | - | 50 | 25 | **75** |

**IA: In-Semester Assessment - Paper Duration – 1.5 Hours**

**ESE: End Semester Examination - Paper Duration - 3 Hours**

**AC: Activity**

**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)

**Prerequisite:** Computer Basics, Procedural Programming Languages

**Course Objective:** The course intends to deliver the OOP concepts using Java and to help students design and implement real world applications.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Apply fundamental programming constructs. | L1, L2, L3 |
| 2 | Experiment with concept of class, objects, strings, arrays and vectors. | L1, L2, L3 |
| 3 | Experiment with concept of inheritance and interfaces. | L1, L2, L3 |
| 4 | Experiment with concept of exception handling. | L1, L2, L3 |
| 5 | Experiment with notion of multithreading and packages. | L1, L2, L3 |
| 6 | Develop GUI based application | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Object Oriented Concepts**<br>Basics of object oriented programming , OOP Concepts: Object, Class, Encapsulation, Abstraction, Inheritance, Polymorphism | 2 | L1, L2, L3 |
| 2 | **Introduction to Java**<br>Basics of Java programming, Data types, Variables, Operators, Looping ,Strings, Arrays in java ,Input / Output in java , objects and classes in java, , Constructor and its types, Visibility modifiers, this reference | 3 | L1, L2, L3 |

| | | | |
|---|---|---|---|
| 3 | **Inheritance and Polymorphism**<br>Inheritance in java, Super and sub class, Polymorphism, Dynamic binding, Abstract class, Interface in java | 2 | L1, L2, L3 |
| 4 | **Exception Handling**<br>Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class | 2 | L1, L2, L3 |
| 5 | **Multithreading in java**<br>Thread life cycle and methods, Thread class, Runnable interface, Thread synchronization, Package in java | 2 | L1, L2, L3 |
| 6 | **Event and GUI programming**<br>Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, TextFields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing.. Database Connectivity | 4 | L1, L2, L3 |
| | **Total Hours** | **15** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Programming with Java(Fifth Edition) | E Balagurusamy | McGraw Hill | Sixth Edition | 2019 |
| 2 | Java Programming, D. S. Malik | D. S. Malik | Cengage Learning | First Edition | 2009 |
| 3 | Programming in Java | Sachin Malhotra &Saurabh Chaudhary | Oxford University Press | Second Edition | 2018 |
| 4 | The Complete Reference, Java 2 | Herbert Schild | McGraw Hill. | Fourth Edition | 2011 |
| 5 | Head First Java: A Brain-Friendly Guide | Kathy Sierra and Bert | O'Reilly Media | Second Edition | 2005 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.javatpoint.com | https://www.javatpoint.com/java-oops-concepts | M1,M2,M3 |
| 2 | www.w3schools.com | https://www.w3schools.com/java/ | M1-M6 |
| 3 | www.programiz.com | https://www.programiz.com/java-programming | M1-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Apply installation steps to set the environment variables and run a simple java program. | 2 | L1, L2 |
| 2 | | Experiment with various ways to accept data through keyboard for 1D and 2D array | 2 | L1, L2 |
| 3 | **Design Experiments** | Experiment with class creation including members and methods, accepting and displaying details for single object. | 2 | L1, L2, L3 |
| 4 | | Experiment with constructor and constructor overloading | 2 | L1, L2, L3 |
| 5 | | Experiment with String and String Buffer | 2 | L1, L2, L3 |
| 6 | | Experiment with single and multilevel inheritance (Use super keyword). | 2 | L1, L2, L3 |
| 7 | | Experiment with demonstration of try, catch, throw, throws and finally | 2 | L1, L2, L3 |
| 8 | | Experiment with creating user defined package | 2 | L1, L2, L3 |
| 9 | | Experiment with implementing multithreading using Thread class and Runnable interface | 2 | L1, L2, L3 |
| 10 | | Experiment with Applet to demonstrate Graphics, Font and Color class | 2 | L1, L2, L3 |
| 11 | | Experiment with creation of GUI application with event handling using AWT controls | 2 | L1, L2, L3 |
| 12 | | Make use of database connectivity to develop java application. | 2 | L1, L2, L3 |
| 13 | **Mini/Minor Projects/ Seminar/ Case Studies** | Mini Project based on content of the syllabus. (Group of 2-3 students)<br>1. Gaming System<br>2. Hotel Reservation System<br>3. Airline Reservation System<br>4. Hospital Management System<br>5. Online chat application<br>6. E-commerce website | 6 | L1, L2, L3 |
| | | **Total Hours** | **30** | |

**S.E. Semester –III**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="5">B.E. ( Computer Engineering )</td><td colspan="3">S.E. SEM : III</td></tr>
<tr><td colspan="5">Course Name: Project Based Learning – I</td><td colspan="3">Course Code :HSD-CSPBL301</td></tr>
<tr><td colspan="5">Teaching scheme (Holistic Student Development - HSD)<br>Industry Specific/Interdisciplinary</td><td colspan="3">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="3">Assessment/Evaluation Scheme</td></tr>
<tr><td colspan="5" rowspan="2">Conducted in the beginning of Semester during first 3 Weeks</td><td>Presentation (25)</td><td>Report (25)</td><td>Term Work</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>(AC)</td><td>(AC)</td><td rowspan="2">25</td></tr>
<tr><td>-</td><td>-</td><td>30</td><td>30</td><td>1</td><td>25</td><td>-</td></tr>
<tr><td colspan="8">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>AC: Activity<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="8">Prerequisite: Computer Fundamentals and Knowledge of Programming Languages</td></tr>
</table>

**Course Objective:** The Course intends to aid students identify real world problems and apply computing fundamental and technical skill to find solutions to them.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Interpret the basic real time problems. | L1, L2 |
| 2 | Apply appropriate technologies and programming constructs to solve problems. | L1, L2, L3 |
| 3 | Inspect the results obtained for documentation and presentation. | L1, L2, L3, L4 |

## Projects Listing:

| Sr. No. | Title of Project | Type of Project |
|---|---|---|
| 1 | Implementing system for text encryption and decryption | Application |
| 2 | Implementing Hospital Management System | Application |
| 3 | Implementing Employee Management System | Application |
| 4 | Implementation of Payroll System | Application |
| 5 | Implementing system for Bus Booking | Application |
| 6 | Implementation of Currency Converter System | Application |
| 7 | Design and Development of Game | Core |
| 8 | Design and Development of system for scheduling of events | Core |
| 9 | Design and development of IQ Test System | Core |
| 10 | Develop an app for Invoice | Core |

**S.E. Semester –III**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E.(Computer Engineering)</td><td colspan="4">S.E. SEM : III</td></tr>
<tr><td colspan="7">Course Name :Activity Based Learning-III</td><td colspan="4">Course Code: HSD-CSABL301</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Conducted in the beginning of Semester during first 3 Week</td><td colspan="2">Theory (25)</td><td rowspan="2">Presentation (25)</td><td rowspan="2">Report (25)</td><td rowspan="2">Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td></tr>
<tr><td>-</td><td>-</td><td>30</td><td>30</td><td>1</td><td>-</td><td>-</td><td>25</td><td>25</td><td>50</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>AC: Activity<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Basics of Computer Programming, General knowledge, Social awareness</td></tr>
</table>

**Course Objective:** The larger objective of the course is to develop the Socially Sensitive Citizens by creating awareness among students through Activity mode.
The course intends to deliver the understanding of the concepts by encouraging the students to look beyond their textual knowledge, establish the relationship between theory and the applications of the learned concepts. It also intends to address the social issues and create awareness.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcome | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Construct his views independently and demonstrate various debate styles. | L1, L2, L3 |
| 2 | Identify the various benefits of quiz competitions. | L1, L2, L3 |
| 3 | Utilize the society awareness in various social issues | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Extempore/Debate**<br>**I. Introduction to debate**, Definition and types of Debate Brainstorming session among students on various topics floated for debate. Topics can be Academic or Parliamentary, Financial, International affairs, technology trends, Technical or philosophical. Extempore speech by each student for /against topic for 1 minute.<br>**II. Debate competition**. Formation of four teams for two topics. Two teams (For and against) for topic I will debate first and the other two team will be audience and for topic II vice-versa.<br>**Evaluation by faculty as per format.** | 4 | L1, L2, L3 |
| 2 | **General Knowledge (Technical and Current Affairs)**<br>**I. Introduction to Quiz**, Definition, Types of quiz, Rules of quiz, quiz rounds. Quiz competition on Technical topic with 50 MCQ.<br>**II.** Puzzle/**Quiz competition on current affairs** with 50 MCQ.<br>**Evaluation by faculty as per format.** | 4 | L1, L2, L3 |
| 3 | **Personality Development**<br>**I. Word association (Test Sentence Building) (2 Hrs.)** Students are shown 60 English words one after other and a short sentence using the words shown are to be written. Each word will appear for 15 seconds and sentence is to be written within this period only. At least 45 words are to be attempted to get good marks<br>**II. Thematic Apperception Test (Short Story Writing)(2 Hrs.)**<br>12 Slides will be projected, and stories are to be written in 03 Minutes. Discussions on Stories written by students<br>**Evaluation by faculty as per format.** | 4 | L1, L2, L3 |
| 4 | **Extended Work**<br>**Introduction to Street play-T**ypes of Street play, Writing and demonstration of street Play on social Issues Water conservation Waste Management Plastic Ban etc.<br>**Evaluation by faculty as per format** | 6 | L1, L2, L3 |
| 5 | **Awareness creationon social issues**<br>Students will develop material like placard, posters etc. for creating awareness on issue like<br>• Education on social Issues like social media, youth related issues etc.<br>• Education on health issues<br>• Education on issues related to senior citizen etc.<br>**The education/ awareness** needs to be conducted in campus through presentation(placards, posters etc.).<br>**Evaluation by faculty as per format**<br>**Data collection and Analysis:**<br>survey's needs to be developed and conducted, data analysis and results interpretation **Evaluation by faculty as per format** | 6 | L1, L2, L3 |

| | | | |
|---|---|---|---|
| 6 | **Extempore/Debate**<br>**I. Introduction to debate**, Definition and types of Debate Brainstorming session among students on various topics floated for debate. Topics can be Academic or Parliamentary, Financial, International affairs, technology trends, Technical or philosophical. Extempore speech by each student for /against topic for 1 minute.<br>**II. Debate competition**. Formation of four teams for two topics. Two teams (For and against) for topic I will debate first and the other two team will be audience and for topic II vice-versa.<br>**Evaluation by faculty as per format.** | 6 | L1, L2, L3 |
| | **Total Hours** | **30** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Competitive Debate | Richard Earl | Alpha | - | 2008 |
| 2 | Times Quiz book by Times Mind Games | Olav, Bjortomt | Times Books | - | 2016 |
| 3 | Cracking the coding Interview | Gayle Laakmann | Createspace | - | 2011 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.cleverism.com | https://www.cleverism.com/18-best-idea-generation-techniques/ | M1 |
| 2 | www.thebetterindia.com | https://www.thebetterindia.com/111/teaching-street-children-a-thing-or-two/ | M6 |

**S.E. Semester –IV**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **S.E. SEM: IV** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Mathematics-IV | | | | | | | **Course Code:** BSC-CS401 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | 1 | - | 4 | 4 | 25 | 75 | - | 25 | **125** |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours** | | | | | | | | | |
| **ESE: End Semester Examination - Paper Duration - 3 Hours** | | | | | | | | | |
| **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Basic Mathematics | | | | | | | | | |

**Course Objective:** The course intends to apply the concept of probability, Correlation and Regression, Laplace Transform and Fourier transform to the engineering problems and to evaluate the optimization of two and three variables.

**Course Outcomes:** **Upon completion of the course students will be able to:**

| **Sr. No.** | **Course Outcomes** | **Cognitive levels of attainment as per Bloom's Taxonomy** |
|---|---|---|
| 1 | Apply the concept of probability random variables, mathematical expectations and variance. | L1, L2, L3 |
| 2 | Differentiate the discrete and continuous random variables. | L1, L3 |
| 3 | Evaluate the Maximization and minimization of two and three variables. | L1, L2, L3 |
| 4 | Apply the concept of Correlation and Regression to the engineering problems. | L1, L2, L3 |
| 5 | Develop an understanding of how to read and construct valid mathematical statements, arguments and understand mathematical statements. | L1, L3 |
| 6 | Understand use of groups and codes in Encoding-Decoding and apply discrete structures into other computing problems such as formal specification, verification, artificial intelligence, cryptography, Data Analysis and Data Mining. | L1, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Basic Probability**<br>Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, sums of independent random variables; Expectation of Discrete and Continuous Random Variables, Moments, Variance of a sum, Conditional Probability | 6 | L1, L2, L3 |
| 2 | **Basic Statistics**<br>Measures of Central tendency, Moments, skewness and Kurtosis, Binomial, Poisson and Normal distribution and evaluation of statistical parameters for these three distributions | 6 | L1, L3 |
| 3 | **Linear Programming problems**<br>Types of solutions to linear programming problems, standard form of L.P.P. Simplex method, Big M method (Penalty method) to solve L.P.P, Duality, Dual simplex method and Revised simplex method to solve L.P.P. | 8 | L1, L2, L3 |
| 4 | **Applied Statistics**<br>Correlation and regression – Rank correlation, Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves | 8 | L1, L2, L3 |
| 5 | **Logic**<br>Propositions and logical operations, Truth tables Equivalence, Implications Laws of logic, Normal Forms, Predicates and Quantifiers, Mathematical Induction | 7 | L1, L3 |
| 6 | **Algebraic Structures**<br>Algebraic structures with one binary operation: semigroup, monoid and group, Abelian group, Cyclic groups Homomorphism, Isomorphism, Field and Extension of field. Coding theory: Coding of binary information and error detection, decoding and error correction. | 10 | L1, L3 |
| | **Total Hours** | **45** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Advanced Engineering Mathematics | Erwin kreyszig | John Wiley & Sons | Ninth Edition | 2006 |
| 2 | A text book of Engineering Mathematics | N.P. Bali and Manish Goyal | Laxmi Publications | Tenth Edition | 2008 |
| 3 | Elements of Discrete Mathematics | C. L. Liu and D. P. Mohapatra | McGraw Hill | 2nd Edition | 2010 |
| 4 | Engineering Mathematics | Veerarajan T | Tata McGraw-Hill, New Delhi | Third Edition | 2008 |
| 5 | Introduction to Probability Theory | P. G. Hoel, S. C. Port and C. J. Stone | Universal BookStall | Reprint | 2003 |
| 6 | Operations Research | S.D. Sharma | S. Chand & CO. | - | - |
| 7 | A First Course in Probability | S. Ross | Pearson Education India | Sixth Edition | 2002 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.statisticssolutions.com | https://www.statisticssolutions.com/continuous-probability-distribution/ | M1, M2, M4 |
| 2 | nptel.ac.in | https://nptel.ac.in/courses/111105123/ | M5, M6 |
| 3 | www.analyticsvidhya.com | https://www.analyticsvidhya.com/blog/2017/02/lintroductory-guide-on-linear-programming-explained-in-simple-english/ | M3 |

## List of Tutorials:

| Sr. No | Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Tutorial on Conditional Probability and Bayes theorem | 1 | L1, L2, L3 |
| 2 | Tutorial on discrete random variable | 1 | L1, L2 |
| 3 | Tutorial on continuous random variable | 1 | L1, L2, L3 |
| 4 | Tutorial on measure of Central Tendency and Dispersion | 1 | L1, L2, L3 |
| 5 | Tutorial on Binomial and PoissonDistribution | 1 | L1, L2 |
| 6 | Tutorial on Normal Distribution | 1 | L1, L2 |
| 7 | Tutorial on Simplex method | 1 | L1, L2 |
| 8 | Tutorial on Dual Simplex method | 1 | L1, L2, L3 |
| 9 | Tutorial on Correlation | 1 | L1, L2, L3 |
| 10 | Tutorial on Regression | 1 | L1, L2, L3 |
| 11 | Tutorial on Curve fitting | 1 | L1, L2, L3 |
| 12 | Tutorial on logic operations and truth tables equivalence | 1 | L1, L2, L3 |
| 13 | Tutorial on Normal Forms, Predicates and Quantifiers | 1 | L1, L2, L3 |
| 14 | Tutorial on Algebraic structures with one binary operation | 1 | L1, L2, L3 |
| 15 | Tutorial on Field and Coding theory | 1 | L1, L2, L3 |
| | **Total Hours** | **15** | |

**S.E. Semester –IV**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">S.E. SEM : IV</td></tr>
<tr><td colspan="7">Course Name : Design and Analysis of Algorithm</td><td colspan="4">Course Code :PCC- CS401</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>3</td><td>-</td><td>2</td><td>5</td><td>4</td><td>25</td><td>75</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Computer Basics, Procedural Programming Languages</td></tr>
</table>

**Course Objective:** The objective of the course is to study various techniques for effective problem solving along with different algorithm designing paradigms in computer science, to illustrate the efficient ways of problem solving for any given problem.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Analyze the complexities of various problems in different domains. | L1, L2, L3, L4 |
| 2 | Apply and analyze the complexity of divide and conquer strategy. | L1, L2, L3, L4 |
| 3 | Apply and analyze the complexity of greedy method, dynamic programming strategy, backtracking and branch and bound strategy. | L1, L2, L3, L4 |
| 4 | Understand, apply and analyze different string matching algorithms | L1, L2, L3, L4 |
| 5 | Compare and contrast various algorithm designing strategies to apply in real world problems. | L1, L2, L3, L4 |
| 6 | Demonstrate the classes P, NP, and NP-Complete. | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Algorithm Analysis**<br>Performance analysis, space and time complexity, Order of Growth of function. Asymptotic notations, Mathematical background for algorithm analysis, Analysis of selection sort, insertion sort. Recurrences: -The substitution method -Recursion tree method -Master method.<br>**Divide and Conquer:** Finding Minimum and maximum, Binary search, Merge sort, Quick sort. | 9 | L1, L2, L3, L4 |
| 2 | **Greedy Method**<br>**Greedy Method**: General method, Single source shortest path, Knapsack problem, Minimum cost spanning trees-Kruskal and prim's algorithm, Job sequencing with deadlines. | 5 | L1, L2, L3, L4 |
| 3 | **Dynamic Programming**<br>**Dynamic Programming**: General method, Multistage graphs, single source shortest path, all pair shortest path, 0/1 knapsack, Travelling salesman problem, Longest common subsequence. | 6 | L1, L2, L3, L4 |
| 4 | **Backtracking and Branch & Bound**<br>**Backtracking**: General method, 8 queen problem (N-queen problem), Sum of subsets.<br>**Branch and Bound**: General method, 15 puzzle problem, Travelling salesman problem. | 10 | L1, L2, L3, L4 |
| 5 | **String Matching Algorithms**<br>The naïve string matching Algorithm, The Rabin Karp algorithm, String matching with finite automata, The knuth-Morris-Pratt algorithm, Boyer Moore algorithm. | 8 | L1, L2, L3, L4 |
| 6 | **Introduction to Non Deterministic algorithm**<br>Polynomial time, Polynomial time verification, classes NP, NP Completeness and polynomial time reduction. | 7 | L1, L2 |
| | **Total Hours** | **45** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Introduction to algorithms | T.H. Coreman, C.E. Leiserson, R.L. Rivest, and C. Stein | PHI | Third Edition | 2009 |
| 2 | Fundamentals of computer algorithms | Ellis Horowitz, Sartaj Sahni, S. Rajsekaran | University Press | Second Edition | 2017 |
| 3 | Algorithms | Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani | Tata McGraw-Hill Edition. | Featured Edition | 2017 |
| 4 | Design Methods and Analysis of Algorithm | S. K. Basu | PHI. | -- | 2005 |
| 5 | Algorithm Design | John Kleinberg, Eva Tardos | Pearson | -- | 2005 |

## e Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.geeksforgeeks.org | https://www.geeksforgeeks.org/fundamentals-of-algorithms/#AnalysisofAlgorithms | M1-M6 |
| 2 | www.tutorialspoint.com | https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm | M1-M3, M6 |
| 3 | www.w3schools.in | https://www.w3schools.in/category/data-structures-tutorial/ | M1,M4 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Develop a code for Quick Sort | 2 | L1, L2, L3 |
| 2 | | Develop a code for Dijkstra's algorithm using Greedy method and analyze it. | 2 | L1, L2, L3 |
| 3 | **Design Experiments** | Develop a code Minimum spanning tree, Kruskal's algorithm using Greedy method and analyze it. | 2 | L1, L2, L3 |
| 4 | | Develop a code for all pair shortest path problem using dynamic programming and analyze it. | 2 | L1, L2, L3 |
| 5 | | Develop a code for Longest common subsequence using dynamic programming and analyze it. | 2 | L1, L2, L3 |
| 6 | | Develop a code for 8 queen's problem using backtracking approach and analyze it. | 2 | L1, L2, L3 |
| 7 | | Develop a code for 15 puzzle problem and analyze it. | 4 | L1, L2, L3 |
| 8 | | Develop a code for naïve string matching Algorithm | 2 | L1, L2, L3 |
| 9 | **Case study:** | Various string matching algorithms and their time and space complexities. | 4 | L1, L2, L3 |
| 10 | **Mini Project:** | 1. Build a Snakes & Ladders game<br>2. Sudoku Solver<br>3. Maze generator<br>4. Dictionary implementation<br>5. Employee Record System<br>6. Super market Billing System | 8 | L1, L2, L3 |
| | | **Total Hours** | **30** | |

**S.E. Semester –IV**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)**

| **B.E. ( Computer Engineering )** | | | | | | | **S.E. SEM : IV** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Operating System | | | | | | | **Course Code :**PCC- CS402 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Computer Organization and Architecture, Fundamentals of Data Structures | | | | | | | | | |

**Course Objective:** The course intends to deliver the fundamental knowledge of Operating system and apply this knowledge for implementing and analyzing Process, Memory, I/O disk and File management techniques.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the role of operating system in a computer | L1, L2 |
| 2 | Make use of various Scheduling algorithms. | L1, L2, L3 |
| 3 | Apply the principles of concurrency. | L1, L2, L3 |
| 4 | Examine deadlock, prevention and avoidance algorithms | L1, L2, L3 |
| 5 | Compare and contrast various memory management schemes | L1, L2 |
| 6 | Develop a prototype file systems. | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Overview of Operating System**<br>Operating System Objectives and Functions, The Evolution of Operating Systems, Operating System Structures, System Calls, Developments Leading to Modern Operating Systems, Virtual Machines | 4 | L1, L2 |

| | | | |
|---|---|---|---|
| 2 | **Process Management**<br>**Processes and Threads:** Process: Concept of a Process, Process States, Process Description, Operations on Processes, Execution of the Operating System; Threads: Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using Pthreads; Scheduling: CPU Scheduling, Thread Scheduling. | 4 | L1, L2, L3 |
| 3 | **Concurrency Control and Deadlock Handling**<br>**Concurrency Control:** Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Hardware Support, Operating System Support (Semaphores and Mutex), Programming Language Support (Monitors), Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem, Inter-process communication.<br>**Deadlock:** Principles of Deadlock, Deadlock Modeling, Strategies to deal with deadlock: The Ostrich Algorithm, Deadlock Prevention, Deadlock Avoidance, Deadlock detection and recovery, An Integrated Deadlock Strategy, Example: Dining Philosophers Problem. | 10 | L1, L2,L3 |
| 4 | **Memory Management**<br>**Memory Management:** Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Segmentation.<br>**Virtual Memory:** What is Virtual Memory, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory. | 10 | L1, L2, L3 |
| 5 | **Input / Output And File Management**<br>I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling(FIFO, SSTF, SCAN, C-SCAN, LOOK, C-LOOK), Disk Cache. File Management: Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management. | 10 | L1, L2 |
| 6 | **Case Study: LINUX Operating System**<br>Overview of Linux, Architecture, Process management, Memory Management, I/O Management, BASH Shell scripting: Basic shell commands, shell as a scripting language. | 7 | L1, L2,L3 |
| | **Total Hours** | **45** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Operating System: Internals and Design Principles | William Stallings, | Prentice Hall | Eighth Edition | 2018 |
| 2 | Operating System Concepts | Abraham Silberschatz, Peter Baer Galvin and Greg Gagne | WILEY | Ninth Edition | 2009 |
| 3 | Modern Operating System, | Andrew S. Tanenbaum& Herbert Bos | Pearson | Fourth Edition | 2015 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.tutorialspoint.com | https://www.tutorialspoint.com/computer_fundamentals/computer_operating_system | M1-M6 |
| 2 | www.geeksforgeeks.org | https://www.geeksforgeeks.org/operating-systems-need-and-functions/ | M1-M6 |
| 3 | nptel.ac.in | https://nptel.ac.in/courses/106106144/2 | M1-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Explore LINUX Commands (Basic and Advanced) | 2 | L1, L2, L3 |
| 2 | | Write a program to implement any two CPU scheduling algorithms like FCFS, SJF, Round Robin etc. | 2 | L1, L2, L3 |
| 3 | **Design Experiments** | Write a program to implement Dinning Philosopher Problem. | 2 | L1, L2, L3 |
| 4 | | Write a program to implement Banker's algorithm. | 2 | L1, L2, L3 |
| 5 | | Build a program to implement FIFO and LRU page replacement policies. | 2 | L1, L2, L3 |
| 6 | | Build a program to implement SRTF and Priority page replacement policies. | 2 | L1, L2, L3 |
| 7 | | Develop a program to implement dynamic partitioning placement algorithms i.e. Best Fit, First-Fit, Worst-Fit etc. | 4 | L1, L2, L3 |
| 8 | | Build a program to implement FCFS and SSTF disk scheduling algorithm | 4 | L1, L2, L3 |
| 9 | **Case Study** | **Case Study**<br>1. Windows Operating System.<br>2. LINUX Operating System.<br>3. Multiprocessor Scheduling and Linux Scheduling. | 4 | L1, L2, L3 |
| 10 | **Mini Project** | 4. Develop a Client-Server application (use the concepts of inter-process communication, multithreading, synchronization and so).<br>5. Build a file system.<br>6. Write a shell interpreter for LINUX. Build an online compiler (with interface for inserting the code to be compiled). | 6 | |
| | | **Total Hours** | **30** | |

**S.E. Semester –IV**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">S.E. SEM : IV</td></tr>
<tr><td colspan="7">Course Name : Computer Networks</td><td colspan="4">Course Code :PCC-CS403</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination scheme</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>3</td><td>-</td><td>2</td><td>5</td><td>4</td><td>25</td><td>75</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA:In-Semester Assessment- Paper Duration – 1 Hours<br>ESE :End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Computer System Basics, Programming Language (C/C++/Java)</td></tr>
</table>

**Course Objective:** The course intends to deliver fundamental knowledge about various aspects of computer networks and apply the knowledge acquired to understand/solve problems in networking.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Objectives | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Explain the basic concepts of digital communication. | L1, L2 |
| 2 | Explain the concepts and fundamentals of computer networks and reference models. | L1, L2 |
| 3 | Differentiate between types of transmission media, multiplexing techniques and switching techniques | L1, L2, L3 |
| 4 | List the functionalities of Data link layer and analyze various design issues. | L1, L2, L3, L4 |
| 5 | List the routing protocols of Network layer and solve subnetting and super-netting problems. | L1, L2, L3, L4 |
| 6 | Illustrate how the application layer protocols utilizes transport layer protocols (TCP/UDP) | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Basics of Digital Communication**<br>**Introduction:** Theoretical basis for communication; Maximum data rate of a channel: Transmission impairments; Attenuation distortion, Delay distortion, Noise; Data transmission modes: Serial & Parallel, Simplex, Half duplex & full duplex, Synchronous & Asynchronous transmission | 5 | L1, L2 |

| | | | |
|---|---|---|---|
| 2 | **Introduction to Computer Networks**<br>Definition of a Computer Network; Components of a computer network: Classification of networks, network types, Network topologies, networking devices.<br>**Network Software &Network Standardization:** Networks Software; Protocol hierarchy, Design issues for the layers, Service Primitives:<br>**Reference models:** Introduction and comparison of the OSI Reference Model and TCP/IP Reference Model | 6 | L1, L2 |
| 3 | **Physical Layer**<br>**Introduction:** Switching Techniques; Comparison of switching techniques; Multiplexing: FDM,TDM,WDM<br>**Transmission Medium:** Guided & Unguided Transmission medium: Twisted pair, Coaxial cable, Optical fiber, Wireless transmission<br>**DLL Design Issues** (Services, Framing, Error Control, Flow Control) | 7 | L1, L2, L3 |
| 4 | **Data Link Layer**<br>**Error Detection and Correction** (Hamming Code, CRC, Checksum), Elementary Data Link protocols for flow control,<br>**Medium Access Control sub layer:** Channel Allocation problem, Types of Multiple Access Protocol, Local Area Networks -Ethernet (802.3) | 8 | L1, L2, L3, L4 |
| 5 | **Network Layer**<br>**Introduction and Design issues** of Network layer; Routing: Principles of Routing, Types of routing algorithms, Comparison of routing algorithms; Protocols at network layer;<br>**Congestion**: Factors of congestion and Congestion control algorithms: Open loop congestion control, Closed loop congestion control, QoS parameters, Token & Leaky bucket algorithms | 10 | L1, L2, L3, L4 |
| 6 | **Transport Layer & Application Layer**<br>**The Transport Service**: Transport service primitives, Connection management (Handshake), UDP, TCP, TCP Flow control (sliding Window), TCP Congestion Control: Slow Start<br>**Application layer:** DNS: Name Space, Resource Record and Types of Name Server. HTTP, SMTP, Telnet, FTP, DHCP | 9 | L1, L2, L3, L4 |
| | **Total Hours** | **45** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Computer Networks | A.S. Tanenbaum | Pearson Education | Fifth Edition | 2013 |
| 2 | Data Communications and Networking | B.A. Forouzan | McGraw Hill | Fifth Edition | 2017 |
| 3 | Computer Networking, A Top-Down Approach Featuring the Internet | James F. Kurose, Keith W. Ross, | Addison Wesley | Sixth Edition | 2017 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | NPTEL | https://nptel.ac.in/courses/106105081/ | M1-M5 |
| 2 | Stanford University | https://lagunita.stanford.edu/courses/Engineering/Networking-SP/SelfPaced/about | M1-M6 |
| 3 | www.tutorialpoint.com | https://www.tutorialspoint.com/computer_fundamentals/computer_networking | M1-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Classify the types of cabling used in networking | 2 | L1, L2, L3 |
| 2 | | Survey various networking devices using Packet Tracer | 2 | L1, L2, L3, L4 |
| 3 | **Design Experiments** | Apply CRC/ Hamming code for error detection and correction | 2 | L1, L2, L3 |
| 4 | | Explain Basic Networking Operations and troubleshooting | 2 | L1, L2, L3 |
| 5 | | Prepare a network and configure it for IP addressing, subnetting, masking. | 2 | L1, L2, L3 |
| 6 | | Demonstrate working of Static Routing Protocols | 2 | L1, L2, L3 |
| 7 | | Demonstrate working of Dynamic Routing Protocols | 4 | L1, L2, L3 |
| 8 | | Show implementation of Socket programming using TCP and Remote Login using Telnet/SSH | 4 | L1, L2, L3 |
| 9 | **Case Studies** | **1.** Analyze Stop and wait protocol/ sliding window (selective repeat / Go back N) in NS2<br>**2.** Simulate congestion control (leaky bucket / token bucket) in NS2. | 4 | L1, L2, L3, L4 |
| 10 | **Seminars/ Project** | **Mini Project:**<br>1. Network Desktop Manager (Java)<br>2. Cloud Network in packet tracer<br>3. IoT network in Cisco Packet Tracer<br>4. MAC Protocols in NS2<br>5. A Network Based Multi-Player Eater Game Use simulator (E.g. NS2) to understand functioning of ALOHA, CSMA/CD. | 6 | L1, L2, L3, L4 |
| | | **Total Hours** | **30** | |

**S.E. Semester –IV**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

| **B.E. ( Computer Engineering )** | | | | | | | **S.E. SEM : IV** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :**Computer Graphics | | | | | | | **Course Code :**PCC-CS404 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | **150** |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Knowledge of C Programming, Basic Data Structures and Mathematics | | | | | | | | | |

**Course Objective:** The course intends to give the student a understating of drawing basic primitive techniques, 2D-3D transformation and apply the concepts for rendering 3D objects.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the basic concepts of Computer Graphics. | L1, L2 |
| 2 | Demonstrate various algorithms for scan conversion and filling of basic objects and their analysis. | L1, L2, L3 |
| 3 | Apply 2D geometric transformations on graphical objects. | L1, L2, L3 |
| 4 | Apply viewing and clipping transformation on graphical objects. | L1, L2, L3 |
| 5 | Explore 3D solid model representation techniques and projections. | L1, L2, L3 |
| 6 | Understand visible surface detection techniques, illumination models and applications of animation. | L1, L2,L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Computer Graphics**<br>Definition, applications, Raster and Random scan display, Input Device, Output Device (Cathode Ray Tube, CRTs for Color Display, The Shadow - Mask CRT, Direct View Storage Tube, Tablets, The light Pen) | 4 | L1, L2 |
| 2 | **Basic Drawing Primitives**<br>Coordinate system, Pixel plotting, Line Drawing algorithm: Digital Differential Analyzer, Bresenhem Line Drawing, Bresenhem and midpoint Circle Drawing algorithm, Midpoint Ellipse drawing algorithm, Aliasing , Antialiasing techniques(Pre and post filtering , super sampling , and pixel phasing)<br>Filled area primitives: Inside-outside test, boundary and flood-fill, scan-line fill | 8 | L1, L2, L3 |
| 3 | **2D Geometric Transformation**<br>Homogenous coordinates, Translation, scaling, fixed point. scaling, rotation, rotation about arbitrary point, , shearing, reflection, composite transformations | 6 | L1, L2, L3 |
| 4 | **Viewing and Clipping**<br>Viewing transformation and Window to Viewport coordinate transformation, Line Clipping Algorithms: Cohen Sutherland, Midpoint Subdivision, Liang Barsky, Polygon Clipping Algorithms: Sutherland Hodgeman, Weiler Artherton | 9 | L1, L2, L3 |
| 5 | **3D Transformation**<br>3D display methods, Wireframe model, sweep representation, Octrees, Binary space partitioning, curved lines and surfaces, cubic spline interpolation methods, Bezier, B-spline curves, Fractals, parallel and perspective projection,3D translation, scaling, rotation, Rotation about arbitrary axis | 9 | L1, L2, L3 |
| 6 | **Hidden Surface Removal and Animation**<br>Visible surface detection concepts, back-face detection, Z buffer method, Painters algorithm, Warnock algorithm, Illumination and Shading Models: Ambient, Specular and Diffuse reflections, Phong and Gouraud shading, Halftoning and Dithering techniques<br>Animation: Key Frame Animation, Animation Sequence, Motion Control Methods, Morphing, Warping- Mesh Warping. | 9 | L1, L2,L3 |
| | **Total Hours** | **45** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Computer Graphics C version, | Hearn & Baker | Pearson | Second Edition | 2002 |
| 2 | Computer Graphics | Samit Bhattacharya | Oxford Publication. | - | 2018 |
| 3 | Computer Graphics Principles and Practice in C | James D. Foley, Andries van Dam, Steven K Feiner, John F. Hughes | Pearson | Second Edition | 2002 |
| 4 | Computer Graphics | Rajesh K. Maurya | Wiley India Publication | - | 2011 |
| 5 | Computer Graphics using OpenGL | Francis S Hill, Jr. and Stephen M Kelley | Prentice Hall | 3 edition | 2007 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.tutorialspoint.com | https://www.tutorialspoint.com/computer_graphics/ | M1-M6 |
| 2 | www.amityhub.com | https://www.amityhub.com/computer-graphics-notes/ | M1-M6 |
| 3 | learnengineering.in | https://learnengineering.in/cs6504-computer-graphics/ | M1-M5 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Develop a program for DDA and Bresenham Line Drawing algorithms | 2 | L1, L2, L3 |
| 2 | | Implement midpoint Circle/Ellipse algorithm | 2 | L1, L2, L3 |
| 3 | | Develop a program for Boundary fill and Flood fill algorithm(using 4-connected and 8-connected approaches) | 2 | L1, L2, L3 |
| 4 | | Develop a program for Basic transformation on 2D objects (Translation, Scaling, Rotation) | 2 | L1, L2, L3 |

| | | | | |
|---|---|---|---|---|
| 5 | **Design Experiments** | Design and develop a program for line Clipping Algorithm | 2 | L1, L2, L3 |
| 6 | | Design and Develop a program for Polygon clipping | 4 | L1, L2, L3 |
| 7 | | a) Develop a program for Bezier curve for n control points<br>b) Design a program to draw Fractals | 4 | L1, L2, L3 |
| 8 | | Implement Basic primitives using Open GL | 2 | L1, L2, L3 |
| 9 | **Case Studies** | **Case Study**<br>1. Computer Graphics in Automotive Design<br>2. Code sign case study in Computer Graphics<br>3. Computer Graphics for Office Automation. | 2 | L1, L2, L3 |
| 10 | **Mini/Minor Projects/ Seminar** | **Mini Project**<br>1. Walking Robot<br>2. Maze Game<br>3. Bus Stop Simulation<br>4. Bull's Eye | 8 | L1, L2, L3,L4 |
| | | **Total Hours** | **30** | |

**S.E. Semester –IV**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

| **B.E. ( Computer Engineering )** | | | | | | | **S.E. SEM : IV** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :**Value Education | | | | | | | **Course Code :** MC-CS401 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 1 | - | - | 1 | - | - | - | - | 25 | **25** |
| **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite: NA**. | | | | | | | | | |

**Course Objective:** The course intends to deliver fundamental knowledge of various aspects to understand the concept of Ethics in Engineering & Human values, significance of values in Self-development, ethical human value and apply values needed for peaceful society, aware value education, towards personal, national and global development.

**Course Outcomes: Upon completion of the course students will be able to:**

| **Sr. No.** | **Course Outcomes** | **Cognitive levels of attainment as per Bloom's Taxonomy** |
|---|---|---|
| 1 | Develop commitment to professional ethics, responsibilities and norms of the engineering practice. | L1, L2, L3 |
| 2 | Develop a good moral character and social attitude. | L1, L2, L3 |
| 3 | Determine the proper use of engineering knowledge to bring uplift in quality of life, along with peace and conflict resolution. | L1, L2, L3 |
| 4 | Propagate ethics and values in society. | L1, L2, L3 |
| 5 | Apply values such as care and compassion; honesty and trustworthiness; | L1, L2, L3 |
| 6 | Global development through integrity; respect; responsibility and understanding tolerance and inclusion. | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Value Education - Introduction**<br>Understanding the importance of Value Education, Need in modern Society, Benefits for students, Adding Value to Life, Self-Exploration as the Process for Value Education. | 2 | L1, L2,L3 |
| 2 | **Values and Ethics**<br>Definition, Concept, Classification, value based life, Present day materialistic approach, importance of value in human lives, Humility, Attitude, self-confidence,<br>Theory, Criteria and Sources of values.<br>Ethics, Role of Ethics, Educational Ethics, imparting ethics in educational age, integrating spirituality with education. | 3 | L1, L2, L3 |
| 3 | **Right Understanding**<br>Providing the Basis for Universal Human values and Ethical Human Conduct, Basis for the Holistic Alternative Unit Universal Human Order, Professional Ethics in the Light of Right Understanding, Vision for Holistic Technologies, and Journey towards the Holistic Alternative- The Road Ahead. | 3 | L1, L2, L3 |
| 4 | **Dealing with Habits**<br>Introduction to Habits- Simple , Serious and Grave bad Habits, Cause of Addiction to bad habits, How some bad habit are bad though they feel good, what implies one to go on with bad habits, How to have right perception ,The Power of Good habits, importance of right association. | 2 | L1, L2, L3 |
| 5 | **Dealing with Stress**<br>About Stress, definition and causes, Positive stress, Negative Stress, Statistics of Stress, and Suicides the present day Stupid idea.<br>How to deal with cries in our life, Art of Tolerance, Making Right Choice, Life Style Management. | 3 | L1, L2, L3 |
| 6 | **Harmony at Various Levels**<br>Understanding the Human Being as co-existence of self and body<br>Harmony in Self, Harmony with the body, Harmony in the Family, Harmony in the Society, Harmony in Nature, Harmony in Existence. | 2 | L1, L2, L3, L4 |
| | **Total Hours** | **15** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Value Education for Young Leaders | Dr. P Hari Krishna | Vashnavi Krishna Publication | Second Edition | 2015 |
| 2 | Value education | Singh Y K | APH Publishing Corporation | Second Edition | 2009 |
| 3 | Professional Ethics | R. Subramanian | Oxford Publication | Fourth Edition | 2017 |
| 4 | Beyond Illusion and Doubt | A. C Bhaktivedanta Swami | BBT | Fifth Edition | 2017 |
| 5 | Open eye Meditation | Shubha Vilas Das | FinGer Print Belief | SecondEdition | 2016 |
| 6 | Life Amazing Secrete | Gaur Gopal Das | Penguin India | First Edition | 2018 |
| 7 | Ethics from Epic | Govinda Das | Tulsi Publication | First Edition | 2015 |
| 8 | Peace and Value Education | Kiruba Charles & V. Arul Selvi | Neelkamal Publications | First Edition | 2016 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | http://www.yourarticlelibrary. com | http://www.yourarticlelibrary.com/education/values-education/value-education-meaning-objectives-and-needs-india/86967 | M1,M2 |
| 2 | https://ed100.org | https://ed100.org/lessons/valueshabits | M4 |
| 3 | http://www.indiancurrents.org | http://www.indiancurrents.org/article-new-education-policy-stress-on-value-education-in-schools-103.php | M5 |

**S.E. Semester –IV**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E. (Computer Engineering)</td><td colspan="4">S.E. SEM: IV</td></tr>
<tr><td colspan="7">Course Name: Summer Internship</td><td colspan="4">Course Code: SI-CS401</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Total Hours : Maximum 2 Weeks ( 60 to 80 Hours ) during summer vacation ( Week 21st to 25th Week)</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">50</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>160*-240*</td><td>4*-6*</td><td>-</td><td>-</td><td>-</td><td>50</td></tr>
<tr><td colspan="9">IA: In-Semester Assessment<br>ESE: End Semester Examination</td></tr>
<tr><td colspan="9">Prerequisite: Fundamental knowledge of Computer Science and Engineering</td></tr>
</table>

## Course Objectives:

The Course intends to get industry like exposure in the college laboratories by carrying out projects using subject studied till 4th semester. Also design innovative techniques / methods to develop the products.
To gain knowledge of marketing and publicizing products developed.

## Course Outcomes: Upon completion of the course students will be able to:

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | To apply subjects knowledge in the college laboratories for carrying out projects | L1, L2,L3 |
| 2 | Able to developed innovative techniques / methods to develop the products | L1, L2,L3 |
| 3 | Able to do marketing and publicity of products developed | L1, L2,L3 |

## Detailed Syllabus:

| Module No. | Topics | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | **Program Specific Internship**<br>Emerging technologies in domains offered by Department of Computer Engineering<br>Applying classroom and laboratory knowledge to design, develop and deploy the products | L1, L2, L3 |
| 2 | **Inter disciplinary Internship**<br>To explore and understand issues and challenges in the other disciplines (EXTC, ELEX, MECH and CIVIL)<br>Design , develop and deploy cost effective products using multidisciplinary approach | L1, L2, L3 |
| 3 | **Industry Specific Internship**<br>issues and challenges in industry<br>Industry specific problems<br>Design , develop and deploy products for startup and SMEs | L1, L2, L3 |
| 4 | **Interpersonal Internship**<br>Interpersonal skills such as leadership, marketing ,publicity and corporate ethics and communication<br>Problem solving , presentation , negotiation skills | L1, L2, L3 |
| 5 | **Social Internship**<br>Different real life issues in the society<br>Identify societal problems and provide engineering solutions to solve these problems | L1, L2, L3 |
| 6 | **Academic Internship**<br>Report preparation, preparation of presentations, copy table book preparation , business proposal and IPR<br>Capture aspirations & expectations through interviews of students.<br>Ways to connect research in technical institutes with industry.<br>Taking inputs from self, local stakeholders and global stake holders which will help to develop process with comparative and competitive study. | L1, L2, L3 |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | The Ultimate Guide to Internships: 100 Steps to Get a Great Internship and Thrive in It (Ultimate Guides) | Eric Woodard | Allworth | I | 2015 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| **1** | https://www.letsintern.com/ | https://www.letsintern.com/internships/summer-internships | M1-M6 |
| 2 | https://codegnan.com | https://codegnan.com/blog/benefits-of-internships-and-importance | M1-M6 |
| 3 | https://www.honorsociety.org | https://www.honorsociety.org/articles?category=internships | M1-M6 |

**S.E. Semester –IV**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">S.E. SEM : IV</td></tr>
<tr><td colspan="7">Course Name :Professional Skills - IV<br>(Introduction to Python)</td><td colspan="4">Course Code :HSD-CSPS401</td></tr>
<tr><td colspan="7">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="7">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Conducted in the beginning of Semester during first 3 Weeks</td><td colspan="2">Theory (100)</td><td>Presentation (25)</td><td>Report (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>AC</td><td>AC</td><td rowspan="2">75</td></tr>
<tr><td>15</td><td>-</td><td>30</td><td>45</td><td>2</td><td>-</td><td>-</td><td>50</td><td>25</td></tr>
<tr><td colspan="9">AC: Activity<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="9">Prerequisite: Computer Basics, Procedural Programming Languages</td></tr>
</table>

**Course Objective:** The course intends to make students learn how to design and program Python applications. The course intends to develop professional skills necessary for becoming technically skilled personnel.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand basic concepts in python. | L1, L2 |
| 2 | Describe various decision making techniques using Python programming language | L1, L2, L3 |
| 3 | Illustrate various OOP concepts in Python | L1, L2, L3 |
| 4 | Comprehend contents of files, directories and text processing with python | L1, L2 |
| 5 | Apply Python programming for data structure using built in functions | L1, L2, L3 |
| 6 | Show GUI and communication with database using python | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Python**<br>Data types in python, Operators in python, Input and Output, Arrays in python, String and Character in python, Importing Packages and Modules | 2 | L1, L2 |
| 2 | **Decision Making and Functions**<br>If statement, if-elif-else, while loop, for loop, break statement, Functions | 3 | L1, L2, L3 |
| 3 | **Object Oriented Programming in Python**<br>Object Oriented Programming features in Python: Implementing Classes , Objects, methods, encapsulation, Inheritance and polymorphism | 2 | L1, L2, L3 |
| 4 | **Advanced Python**<br>Exception Handling, Files handling in Python, Text Processing, Regular expression in python, Reading data | 2 | L1, L2 |
| 5 | **Data Structure in Python**<br>List and Tuples, Vectors and DataFrames, Introduction to Numpy and Pandas libraries | 2 | L1, L2, L3 |
| 6 | **Python Integration Primer**<br>Graphical User interface, Python database connectivity | 4 | L1, L2, L3 |
| | **Total Hours** | **15** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Core Python Programming | Dr. R. Nageswara Rao | Dreamtech Press, Wiley Publication | Second Edition | 2018 |
| 2 | Learn Python 3 The Hard Way | Zed A. Shaw | Pearson Education | First Edition | 2017 |
| 3 | Head First Python: A Brain-Friendly Guide | Paul Barry | Shroff/O'Reilly | Second edition | 2016 |
| 4 | Beginning Python: Using Python 2.6 and Python 3.1 | James Payne | Wrox Publication | First Edition | 2010 |
| 5 | Beginning Python From Novice to Professional | Magnus Lie Hetland | Apress Publication | Second Edition | 2005 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.learnpython.org | https://www.learnpython.org/ | M1,M2,M3 |
| 2 | www.w3schools.com | https://www.w3schools.com/python/ | M1-M6 |
| 3 | www.tutorialspoint.com | https://www.studytonight.com/dbms/ | M1-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1. | **Basic Experiments** | Demonstrate basics of python like data types (strings, array) and Importing Packages and Modules | 2 | L1, L2 |
| 2. | | Develop a program based on control statements | 2 | L1, L2 |
| 3. | **Design Experiments** | Build a program to implement encapsulation, Inheritance and polymorphism in Python. | 2 | L1, L2, L3 |
| 4. | | Build Python program demonstrating use of text processing.(regular expression) | 2 | L1, L2, L3 |
| 5. | | Build Python program to explore<br>1. Files and directories (display file, count number of lines)<br>2. Exception Handling | 4 | L1, L2, L3 |
| 6. | | Build Python program to demonstrate Data Structures in Python (List, Tuples, Vectors, DataFrames) | 2 | L1, L2, L3 |
| 7. | | Develop Python program to convert arrays into DataFrames and merge them together using Numpy and Pandas Library. | 4 | L1, L2, L3 |
| 8. | | 1. Build Python program to create GUI in python using tkinter.<br>2. Develop Python program to demonstrate CRUD (create, read, update and delete) operations on database (SQLite/ MySQL) using python. | 4 | L1, L2, L3 |
| 9. | **Case Studies** | 1. Python libraries in data science<br>2. Python case study to analyse the eligibility of loan. | 2 | L1, L2, L3 |
| 10. | **Mini Project** | 1. Text processing in python<br>2. Desktop application using python (GUI and database)<br>3. SPAM mail checking system using python<br>4. Project based on numpy and pandas. | 6 | L1, L2, L3 |
| | | **Total Hours** | **30** | |

**S.E. Semester –IV**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="5">B.E. ( Computer Engineering )</td><td colspan="3">S.E. SEM : IV</td></tr>
<tr><td colspan="5">Course Name :Project Based Learning – II</td><td colspan="3">Course Code :HSD-CSPBL401</td></tr>
<tr><td colspan="5">Teaching scheme (Holistic Student Development - HSD)<br>Industry Specific/Interdisciplinary</td><td colspan="3">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="3">Assessment/Evaluation Scheme</td></tr>
<tr><td colspan="5" rowspan="2">Conducted in the beginning of Semester during first 3 Weeks</td><td>Presentation</td><td>Report</td><td>Term Work</td></tr>
<tr><td>(AC)</td><td>(AC)</td><td rowspan="2">25</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td></td><td></td></tr>
<tr><td>-</td><td>-</td><td>30</td><td>30</td><td>1</td><td>25</td><td>-</td></tr>
<tr><td colspan="8">AC : Activity<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="8">Prerequisite: Computer Fundamentals and Knowledge of Programming Languages</td></tr>
</table>

**Course Objective:** The Course intends to aid students identify real world problems and apply computing fundamental and technical skill to find solutions to them.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Objectives | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Able to modify the existing project (PBL 1) with additional functionalities. | L1,L2,L3 |
| 2 | Able to evaluate the performance of existing projects by implementing it in different programming languages. | L1,L2,L3 |
| 3 | Able to implement solution using multidisciplinary /Interdisciplinary approaches. | L1,L2,L3,L4 |

## Projects Listing:

| SN. | Title of Project | Type of Project |
|---|---|---|
| 1 | Design and Development of Data Compression Algorithm for SMS | Core |
| 2 | Design and Development of System for Detecting Handwritten Images using CNN | Core |
| 3 | Implementing System for File Transfer through Cryptography | Application |
| 4 | Implementing System for Attendance Management Using Face Recognition | Application |
| 5 | Advanced Application for Weather Forecasting using IoT | Application/ Multidisciplinary |
| 6 | Advanced System for Security Using Biometric Authentication | Application/ Multidisciplinary |
| 7 | Advanced System for Avoiding Phishing Attack | Application |
| 8 | Design and Development of Recommender system for online shopping portal | Core |
| 9 | Implementation of Medical Prescription Reader | Application |
| 10 | Implementing System for File Transfer through Cryptography | Application |
| 11 | Design and development of web portal for Smart City Traveler | Application/ Multidisciplinary |
| 12 | Design and Development of an application for Automated Railway Concession Form System | Application |

**S.E. Semester –IV**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E. (Computer Engineering)</td><td colspan="3">S.E. SEM : IV</td></tr>
<tr><td colspan="7">Course Name : Activity Based Learning-IV</td><td colspan="3">Course Code: HSD-CSABL401</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="5">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="5">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Conducted in the beginning of Semester during first 3 Weeks</td><td colspan="2">Theory (25)</td><td>Presentation</td><td>Report</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>(AC)</td><td>(AC)</td><td rowspan="2">50</td></tr>
<tr><td>-</td><td>-</td><td>30</td><td>30</td><td>1</td><td>-</td><td>-</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">AC : Activity<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Basics of Computer Programming, General knowledge, Social awareness</td></tr>
</table>

## Course Objectives:

The larger objective of the course is to develop the Society Sensitive Citizens by creating awareness among students and take up the initiatives in the Activity mode for the needy.
The course intends to deliver the understanding of the concepts of critical thinking, encourage the students to look beyond their textual knowledge, establish the relationship between theory and the applications of the learned concepts. It also intends to address the social issues and help the society in the area of work.

## Course Outcomes: **Upon completion of the course students will be able to:**

| SN | Course Outcome | Cognitive level attainment as per revised Bloom Taxonomy |
|---|---|---|
| 1 | Apply procedures for Creative writing, which will give them wings of imagination with self-expression in the topic.<br>Learn on multidisciplinary subjects. | L1, L2, L3 |
| 2 | Understand the importance of the *extempore* speech which will help them to think and develop presence of mind.<br>Exposure to Group discussion will provide an opportunity to all team members to give their ideas and opinion on a certain topic. It increases one's listening skills and confidence in speaking. Team building improves. | L1, L2 |
| 3 | Interpret the strengths of survey research including its effectiveness, generalizability, reliability, and versatility. Students will be able to make the awareness about various social issues. | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs | Cognitive level attainment as per revised Bloom Taxonomy |
|---|---|---|---|
| 1 | **Creative writing (technical/non-technical** | | L1, L2, L3 |
| | **I. Introduction to creative writing**.<br>a) Orientation and Introduction to Writing skills both article form and paper writing. Information about the rules and regulations about original writing. Templates of good journals eg. (IEEE format) with emphasize on originality, plagiarism check.<br>Topic distribution in different categories as per choice of students Select the topic of article/ paper either from choice or in consultation with teacher. Discussion forum or Use of internet is allowed for the same.<br>**Brainstorming and prewriting**<br>Form teams divide into 8 teams. 5 students per team.<br>Form the skeleton of the paper with data properly designed. check the plagiarism and shaping the article/paper with the team.<br>**II. Drafting and editing**<br>Continuation of the article/paper shaping, taking care of plagiarism<br>Submit the article /paper introduction in one page outlining the salient features of the topic in hard copy. Students can have the freedom of choosing mentor faculty from college if needed. Finalizing the article/ paper.<br>**Demonstration by students** and evaluation (Presentation of papers of 4 teams with inputs from mentors/teachers )<br>**Evaluation by faculty as per format.** | 2<br>2 | |
| 2 | **Lecturette (Extempore speech)** | | L1, L2, L3 |
| | **I. Introduction**<br>Orientation and Introduction to lecturette/ extempore rules<br>The candidate is required to deliver a short talk for 03 minutes to the group watching him.<br>Choice of topic discussion. Technical/ Non-technical<br><br>**A suitable topic** is to be chosen out of 04 topics given.<br>03 minutes will be given for thinking, jotting down points and organizing the speech without any help.<br>Candidate has to introduce himself/herself in brief before starting the talk.<br><br>**II. Extempore/Presentation by each student**<br>**Evaluation by faculty as per format.** | 2<br>2 | |
| 3 | **Group Discussion** | | L1, L2, L3 |
| | **I. Introduction and orientation about Group discussion and rules** . GDs form an important part of the short-listing process for recruitment or admission in a company or institution. Types of GD Topics such as social, political, economic, technical etc. Topic choice to be given to students and based on that Team formation on the chosen topic Brainstorming among the students to form teams on topics selected.<br>**.Prepare the points for group discussion.** Formation of four teams for two topics. | 2 | |

| | | | |
|---|---|---|---|
| | Two teams (For and against) for topic I will debate first and the other two team will be audience and for topic II vice-versa.<br><br>**II. Paraphrasing/summarizing.** Evaluation will be based on Creativity skills supported by listening and participating proactively by presentation of teams.<br>Group discussion among the teams members sequentially, other teams will be audience to discussing team and vice versa.<br>**Evaluation by faculty as per format** | 2 | |
| 4 | **SURVEY DESIGNING AND STUDY** | | L1, L2, L3 |
| | **I. Introduction and Orientation** to research methodology emphasizing on survey designing. Surveys can be administered in many modes, including: online surveys, email surveys, social media surveys, paper surveys, mobile surveys, telephone surveys, and face-to-face interviewsurveys. Brainstorming and establishing the goal of the project Form teams, divide into 8 teams. 5 students per team.<br>Select the topic of survey topic with feasible insight either from choice or in consultation with teacher. Discussion forum or Use of internet is allowed for the same.<br>**Structuring and Designing the Questionnaire**<br>Create the sample questionnaires(max 10) mapping with goal established<br>Interview the peer team members for data (all students should be asked.) Field survey topics can also be collected.<br><br>**II. Collection of the data** and use the tools for analyses of the survey incorporated if any. Finalizing the results<br>Data analyses in the form of written article and graphs projection for the same.<br>Presentation of survey results by teams<br>(a)Demonstration by students 4 teams<br>b) Presentation of another 4 teams<br>Submission of projects as hard copy<br>Evaluation by faculties | 2<br><br>2 | |
| 5 | **Extended Work** | | L1, L2, L3 |
| | **I Orientation and Introduction about social responsibilities**.<br>Team formation<br>5 students in each team.<br>Visit to nearby community to provide necessary help based on the following topics<br>**(a)Food Waste (TCET canteen) and societies.**<br>Keep record of food waste daily in kilogram, help in designing the display of food wastage every day.<br>Similarly extend the idea in their own society during festivals, gatherings.<br>**(B) Health awareness**<br>Take the record of the societies in which they reside, collect the information about vaccinations (age wise , validity of time etc)<br>Record maintenance<br>**(c) 3-minute Film making or case study** on the above two themes by teams and presentation.<br><br>**Evaluation by faculty as per format.** | 4<br><br>4<br><br>6 | |
| | **Total Hours** | **30** | |

## Books and References:

| S. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Creative Writing Book | Louie StowelL | Usborne Publishing Ltd | - | 2016 |
| 2 | Group Discussion on Current Topics | Major (retd.) P. N. Joshi | Upkar Prakashan | - | 2010 |
| 3 | Complete Guide to Group Discussion | PRASOON. PROF SHRIKANT | V&S Publishers | - | 2011 |
| 4 | Extempore speech, how to acquire and practice it | William Pittenger | Palala Press | - | 2015 |
| 5 | http://theconversation.com/awareness-of-food-waste-can-help-us-appreciate-holiday-meals-105798 | | | | |
| 6 | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5072240/ | | | | |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | theconversation.com | http://theconversation.com/awareness-of-food-waste-can-help-us-appreciate-holiday-meals-105798 | M1-M5 |
| 2 | https://www.ncbi.nlm.nih.gov | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5072240/ | M5 |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: V** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Theory of Computer Science | | | | | | | **Course Code:** PCC-CS501 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | 1 | - | 4 | 4 | 25 | 75 | - | 25 | **125** |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Basic Mathematics | | | | | | | | | |

**Course Objective:** The Objective of this course is to deliver the fundamental concepts of theory of computation describing formal mathematical models of computation such as FA,PDA,LBA and TM by comparing their power, limitations, languages and their applications in computation and complexity theory and also to learn that not all problems are solvable by computers.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | scribe formal models of computation, such as finite automata, pushdown automata, and Turing machines. | L1, L2, L3 |
| 2 | Design Finite Automata's for different Regular Expressions and Languages. | L1, L2, L3 |
| 3 | Compare different types of Grammars and design context free grammars for formal languages. | L1, L2, L3 |
| 4 | Construct and analyze Push Down automata and Turing Machine for formal languages. | L1, L2, L3,L4 |
| 5 | Classify machines by their power to recognize languages. | L1, L2, L3,L4 |
| 6 | Express the understanding of the decidability and decidability problems. | L1,L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Basic Concepts and Finite Automata**<br>**Basic Concepts:** Alphabets, Strings, Languages, Closure properties.<br>**FA without output:** Finite Automata (FA), Deterministic Finite Automata (DFA) and Nondeterministic Finite Automata (NFA): Definitions, transition diagrams and Language recognizers , NFA to DFA Conversion, Equivalence of Deterministic and Nondeterministic Finite Automata, Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Minimization of DFA.<br>**FA with output:** Definition and construction of Moore and Mealy machines and Equivalence ,Applications and limitations of FA. | 9 | L1, L2, L3 |
| 2 | **Regular Expressions and Languages**<br>**Regular Expression (RE):** Equivalence of RE and FA, Arden's Theorem, RE Applications. Grammars and Chomsky hierarchy.<br>**Regular Language (RL):** Proving languages to be Nonregular -Pumping lemma and Closure properties of regular languages. | 6 | L1,L2, L3 |
| 3 | **Context Free Grammar**<br>Definition, Sentential forms, Leftmost and Rightmost derivations, Parse tree, Ambiguity. Simplification and Applications. Normal Forms: Chomsky Normal Forms (CNF) and Greibach Normal Forms (GNF), CFLs - Pumping lemma, Closure properties | 7 | L1,L2, L3 |
| 4 | **Push Down Automata**<br>Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Deterministic PDA , Non-Deterministic PDA , Equivalence of CFG and PDA, Application of PDA | 7 | L1, L2,L3,L4 |
| 5 | **Turing Machine**<br>Definition, Transitions, Design of TM as generator, decider and acceptor. Variants of TM: Multitrack, Multitape , Universal TM, Equivalence of Single and Multi Tape TMs. Applications, Power and Limitations of TMs. | 10 | L1, L2, L3,L4 |
| 6 | **Undecidability**<br>Properties of recursive and recursively enumerable languages, Decidability and Undecidability , Halting problem , Linear bounded automata (LBA), Rice's Theorem , Post's correspondence problem (PCP). | 6 | L1, L2 |
| | **Total Hours** | **45** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Introduction to Automata Theory, Languages and Computation | John. E. Hopcroft, Rajeev otwani, J. D. Ullman, | Pearson Education Asia | 3rd Edition | 2006 |
| 2 | Elements of the Theory of computation | H.R. Lewis and C.H.Papadimitrou | Prentice Hall Inc | 2nd Edition | 1997 |
| 3 | Introduction to languages and the Theory of Computation | John C Martin | TMH | 4th Edition | 2010 |
| 4 | Introduction to Computer Theory | Daniel I.A. Cohen | John Wiley | 2nd Edition | 2007 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.coursera.org | https://www.coursera.org/learn/cs-algorithms-theory-machines | M6 |
| 2 | nptel.ac.in | https://nptel.ac.in/noc/individual_course.php?id=noc16-cs14 | M1-M6 |

## List of Tutorials:

| Sr. No. | Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Tutorial on Construction of Finite Automata. | 1 | L1, L2, L3 |
| 2 | Tutorial on Regular Expression. | 1 | L1, L2, L3 |
| 3 | Tutorial on Regular Expression to Non-Deterministic Finite Automata. | 1 | L1, L2, L3 |
| 4 | Tutorial on Conversion of NFA to DFA. | 1 | L1, L2, L3 |
| 5 | Tutorial on Construction of Mealy and Moore Machine. | 1 | L1, L2, L3 |
| 6 | Tutorial on Construction of CFG and Derivations. | 1 | L1, L2, L3 |
| 7 | Tutorial on Simplification of Context Free Grammar. | 1 | L1, L2, L3 |
| 8 | Tutorial on Conversion of CFG into Normal Forms (CNF & GNF). | 1 | L1, L2, L3 |
| 9 | Tutorial on Construction of PDA.(I) | 1 | L1, L2, L3 |
| 10 | Tutorial on Construction of PDA.(II) | 1 | L1, L2, L3 |
| 11 | Tutorial on Application of Pumping Lemma. | 1 | L1, L2, L3 |
| 12 | Tutorial on Conversion of CFG to PDA. | 1 | L1, L2, L3 |
| 13 | Tutorial on Construction of Turing Machine.(I) | 1 | L1, L2, L3, L4 |
| 14 | Tutorial on Construction of Turing Machine (II) | 1 | L1, L2, L3, L4 |
| 15 | Tutorial on Post Correspondence Problem. | 1 | L1, L2 |
| | **Total Hours** | **15** | |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: V** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Introduction to Intelligent System | | | | | | | **Course Code:** PCC-CS502 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | **150** |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Computer and Programming Basics | | | | | | | | | |

**Course Objective:** To make students understand and explore the techniques underlying the design of Intelligent Systems.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand different types of AI agents. | L1, L2 |
| 2 | Understand AI building blocks presented in intelligent agents. | L1, L2 |
| 3 | Understand and Apply various AI search algorithms uninformed, informed, local, adversarial and backtracking search algorithms to real-world problems. | L1, L2, L3 |
| 3 | Analyze AI approaches for knowledge representation and Uncertain knowledge and reasoning. | L1, L2, L3 |
| 4 | Understand and apply methods for solving Constraint Satisfaction Problems. | L1, L2, L3 |
| 5 | Understand various types of planning and forms of learning. Apply decision tree learning to a given problems. | L1, L2, L3 |
| 6 | Understand various sub areas of Intelligent Systems. | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction**<br>Introduction, History of Artificial Intelligence, Intelligent System Categorization, Components of AI, Foundations of AI, Applications of AI, Current trends in AI. | 4 | L1, L2 |
| 2 | **Intelligent Agents**<br>Agents and Environments, The concept of rationality, The nature of environment, The structure of Agents, Types of Agents, Learning Agent. | 4 | L1, L2 |
| 3 | **Problem Solving and Search**<br>Problem Solving Agent, Formulating Problems, Example Problems, Uninformed Search Methods, Informed Search Method, Local Search Methods, Genetic algorithms, Adversarial Search, Constraint Satisfaction Problems | 10 | L1, L2, L3 |
| 4 | **Knowledge and Reasoning**<br>Knowledge based Agents, The Wumpus World, The Propositional logic, First Order Logic: Syntax and Semantic, Inference in FOL, Forward chaining, backward Chaining, Knowledge Engineering in First-Order Logic, Unification, Resolution, Uncertain knowledge and reasoning: Uncertainty, Representing knowledge in an uncertain domain, The semantics of belief network, Inference in belief network | 10 | L1, L2, L3 |
| 5 | **Planning and Learning**<br>The planning problem, Planning with state space search, Partial order planning, Hierarchical planning, Conditional Planning. Learning: Forms of Learning, Inductive Learning, Learning Decision Tree, Expert System: Introduction, Phases in building Expert Systems, ES Architecture, ES vs Traditional System | 9 | L1, L2, L3 |
| 6 | **Sub Areas of Intelligent Systems**<br>Artificial Neural Network, Fuzzy Systems, Natural Language Processing,<br>Robotics | 8 | L1, L2 |
| | **Total Hours** | **45** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Artificial Intelligence a Modern Approach | Stuart J. Russell and Peter Norvig | McGraw Hill | 3rd Edition | 2009 |
| 2 | A First Course in Artificial Intelligence | Deepak Khemani | McGraw Hill Education (India) | 1st Edition | 2013 |
| 3 | Artificial Intelligence and Intelligent Systems | N. P. Padhy | Oxford | 1st Edition | 2005 |
| 4 | Artificial Intelligence | Elaine Rich and Kevin Knight | Tata McGraw-Hill Education Pvt. Ltd. | 3rd Edition | 2008 |
| 5 | Artificial Intelligence | Rob Callan | Palgrave macmillan | 1st Edition | 2003 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | nptel.ac.in | https://nptel.ac.in/courses/106102220/ | M1-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | Basic Experiments | Specify problem formulation for an AI problem and Implement the same. | 2 | L1, L2 |
| 2 | Design Experiments | Apply uninformed search on given problem. | 2 | L1, L2, L3 |
| 3 | | Apply informed search on given problem. | 2 | L1, L2, L3 |
| 4 | | Apply Adversarial Search on given problem. | 2 | L1, L2, L3 |
| 5 | | Apply genetic algorithm on given problem. | 2 | L1, L2, L3 |
| 6 | | Apply Minimax with Alpha-Beta Pruning on given problem. | 2 | L1, L2, L3 |
| 7 | | Apply Backtracking Search on given problem. | 2 | L1, L2, L3 |
| 8 | | Solve a reasoning problem using unification. | 2 | L1, L2, L3 |
| 9 | | Apply Decision Tree Learning on given problem. | 2 | L1, L2, L3 |
| 10 | Case Studies and Mini Project | me Development<br>art Apps<br>atbot<br>diction Systems<br>elligent Systems | 12 | L1, L2, L3,L4,L5, L6 |
| | **Total Hours** | | 30 | |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E. (Computer Engineering)</td><td colspan="4">T.E. SEM: V</td></tr>
<tr><td colspan="7">Course Name: Software Engineering</td><td colspan="4">Course Code: PCC-CS503</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>3</td><td>-</td><td>2</td><td>5</td><td>4</td><td>25</td><td>75</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Object Oriented Programming, Frontend Backend connectivity</td></tr>
</table>

**Course Objective:** The objective of the course is to introduce to the students about the development of software product, the processes that provides a framework for the engineering methodologies and practices. Also to give the information regarding the phases including the analysis, design, testing methodologies and quality assurance.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the use of basic and advanced models in software engineering | L1, L2 |
| 2 | Analyze the scenarios to design the UML diagrams | L1, L2, L3,L4 |
| 3 | Understand and apply the different techniques of project estimation an understand the tracking methods | L1, L2, L3,L4 |
| 4 | Understand the design concepts and apply them to the project | L1, L2, L3,L4 |
| 5 | Identify risks, manage the change to assure quality in software project. | L1, L2, L3,L4 |
| 6 | Apply the principles of testing and develop test plan for the project | L1, L2, L3,L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction**<br>Introduction to software engineering, Importance of Software engineering Software Process, Various models for Software Development (Waterfall, Spiral, Agile (Scrum), V-Model, RAD, DevOps), Capability Maturity Model (CMM). | 6 | L1, L2,L3 |
| 2 | **Requirements Analysis and Modelling**<br>Requirement Elicitation, Software requirement specification (SRS),Data Flow Diagram(DFD), Feasibility Analysis, Cost- Benefit Analysis, Developing Use Cases (UML), Requirement Model – Scenario-based model, Class-based model, Behavioral model. | 8 | L1, L2, L3,L4 |
| 3 | **Project Scheduling and Tracking**<br>Software Project Estimation: LOC, FP, Empirical Estimation Models - COCOMO II Model<br><br>Project scheduling: Timeline charts, CPM | 4 | L1, L2, L3,L4 |
| 4 | **Software Design**<br>Design Concepts, Characteristics of Good Design, Effective Modular Design – Cohesion and Coupling. Architectural Styles, UI Design | 8 | L1, L2, L3 |
| 5 | **Software Risk, Configuration Management & Quality Assurance**<br>Risk Identification, Risk Assessment, Risk Projection, RMMM, Software Configuration management , Software Quality Assurance: Software Reliability, Formal Technical Review (FTR), Walkthrough | 8 | L1, L2, L3,L4 |
| 6 | **Software Testing and Maintenance**<br>Software Testing, Unit testing, Integration testing Verification, Validation Testing, System Testing, Test plan, White-Box Testing , Basis Path Testing, Control Structure Testing, Black-Box Testing, Software maintenance and its types, Software Re-engineering, Reverse Engineering | 11 | L1, L2, L3,L4 |
| | **Total Hours** | **45** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Software Engineering: A Practitioner's Approach" | Roger Pressman | McGraw-Hill Publications | Sixth Edition | 2009 |
| 2 | Software Engineering | Ian Sommerville | Pearson Education | 9th Edition | 2017 |
| 3 | Software Engineering Fundamentals | Ali Behfrooz and Fredeick J.Hudson, | Oxford University Press | 1st edition | 1997 |
| 4 | Software Engineering – Concepts and Practices | Ugrasen Suman | Cengage Learning | 1st edition | 2012 |
| 5 | An integrated approach to Software Engineering | Pankaj Jalote | Springer/Narosa | 1st edition | 2012 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.tutorialspoint.com | https://www.tutorialspoint.com/sdlc/sdlc_overview.htm | M1-M6 |
| 2 | www.guru99.com | https://www.guru99.com/software-testing-introduction-importance.html | M1-M3, |
| 3 | www.tutorialspoint.com | https://www.tutorialspoint.com/software_testing/software_testing_qa_qc_testing.htm | M4,M6 |
| 4 | https://en.wikipedia.org | https://en.wikipedia.org/wiki/DevOps | M1 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | **Basic Experiments** | ply the knowledge of SRS and prepare Software Requirement Specification (SRS) document in IEEE format for the project | 2 | L1, L2, L3 |
| 2 | | tch a DFD (up to 2 levels) | 2 | L1, L3 |
| 3 | **Design Experiments** | tch UML Use case Diagram for the project. | 2 | L1, L3 |
| 4 | | tch a Class Diagram for the project. | 4 | L1, L3 |
| 5 | | tch Activity, State Transition diagram for the project. | 4 | L1, L3 |
| 6 | | tch Sequence and Collaboration diagram for the project | 4 | L1, L3 |
| 7 | | project management tool to prepare schedule for the project. | 2 | L1, L3 |
| 8 | | Change specification and use any SCM Tool to make different versions | 2 | L1, L3 |
| 9 | | Design test cases and generate test scripts in Selenium | 4 | L1, L2, L3 |
| 10 | **Mini/Minor Projects/ Seminar/ Case Studies** | **Mini Project:**<br>1. Online banking system<br>2. Online hotel management system<br>3. Online sales Order Processing and Invoicing | 4 | L1, L2, L3, L4 |
| | | **Total Hours** | **30** | |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: V** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Microprocessor | | | | | | | **Course Code**: PCC-CS504 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | **150** |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Basic Mathematics | | | | | | | | | |

**Course Objective:** The course intends to introduce basic and advanced software and hardware architecture of Intel X86 processors, use of assembly language and mixed mode programming. It also introduces microcontroller and its applications.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Describe 16-bit architecture of 8086 Microprocessor. | L1, L2 |
| 2 | Apply the assembly and mixed language programming to develop small embedded application. | L1, L2, L3 |
| 3 | Sketch 8086 based system using memory and peripheral chips. | L1,L2, L3 |
| 4 | Analyze the role of 32bit microprocessor architecture over 16 bit architecture. | L1,L2,L3,L4 |
| 5 | Compare Pentium family microprocessors. | L1, L2, L3,L4 |
| 6 | Differentiate between microprocessor and microcontroller. | L1, L2,L3,L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Intel 8086 Microprocessor**<br>Architecture of 8086 processor , Register set, Memory segmentation, Functional Pin Diagram, Operating Modes, Minimum mode 8086 system and Timing diagrams , Maximum mode 8086 system and Timing diagrams. | 8 | L1, L2 |
| 2 | **Instruction set and Assembly Language Programming**<br>Instruction set, Addressing Modes, Assembler Directives, Macros and Procedure, Assembly Language Programming, Mixed Mode programming | 6 | L1, L2, L3 |
| 3 | **Memory and Peripheral Interfacing with 8086**<br>Memory Interfacing - RAM and ROM<br><br>8259 PIC – Interrupt, Types of Interrupts, Interrupt Service Routine, Interrupt Vector Table, Block Diagram of 8259, Interfacing the 8259 in single and cascaded mode with 8086.<br><br>8255 PPI - Block diagram, Command word format, Interfacing 8255 with 8086. | 8 | L1,L2, L3 |
| 4 | **Intel 80386DX Processor**<br>Architecture of 80386DX processor, Register Organization, Operating Modes: Real Mode, Protected Mode And Virtual 8086 Mode, Protected mode Address Translation mechanism: Segmentation and Paging. | 8 | L1,L2,L3,L4 |
| 5 | **Pentium Family processors**<br>Superscalar architecture, Super pipelining, Data flow architecture, Comparative study of Pentium family processors. | 7 | L1, L2, L3,L4 |
| 6 | **The Microcontroller 8051**<br>Introduction to 8051 Microcontroller, Architecture, Pin configuration, Memory organization, Input /Output Ports, Serial communication, Interrupts | 8 | L1, L2,L3,L4 |
| | **Total Hours** | **45** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | 8086/8088 family: Design Programming and Interfacing | John Uffenbeck | PHI | First Edition | 2009 |
| 2 | Advanced Microprocessors and Peripherals | K M Bhurchandani, A k Ray | McGraw Hill | Third Edition | 2006 |
| 3 | The 80386DX Microprocessor: hardware, Software and Interfacing | Walter A Triebel | Prentice Hall | First Edition | 1992 |
| 4 | Pentium Processor System Architecture | Tom Shanley & Don Anderson | Addison-Wesley | Fourth Edition | 2008 |
| 5 | Intel Microprocessors | Barry B. Brey | Pearson Education India | Eighth Edition | 2009 |
| 6 | Microprocessor and Interfacing | Douglas Hall | Tata McGraw Hill | Third Edition | 2006 |
| | IBM PC Assembly language and Programming | Peter Abel | PHI | Fifth edition | 2002 |
| 7 | The 8051 microcontroller and embedded systems | Mazidi Ali, Muhammad Mazidi Gillispie Janice | PHI | Second Edition | 2012 |
| 8 | The 8051 Microcontroller: Architecture, Programming, and Applications | Kenneth Ayala J | Thomson Delmar learning | Second Edition | 1996 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.datasheetspdf.com | https://datasheetspdf.com/pdf/544568/Intel/8086/1 | M1, M2, M4 |
| 2 | nptel.ac.in | https://nptel.ac.in/courses/106108100/ | M1,M2,M3, M4,M5 |
| 3 | www.alldatasheet.com | https://www.alldatasheet.com/view.jsp?Searchword=80386D&sField=2 | M4 |

**List of Practical/ Experiments:**

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Apply Assembly Language Programing to enter and display 8 bit & 16 bits number | 2 | L1, L2, L3 |
| 2 | | Apply Assembly Language Programing to covert HEX to BCD and BCD to HEX. | 2 | L1, L2, L3 |
| 3 | **Design Experiments** | Apply Assembly Language Programing to perform addition and subtraction of two 16 bits numbers using macros and procedure. (Menu Based). | 2 | L1,L2,L3 |
| 4 | | Apply Assembly Language Programing to perform string operations.<br>(i)Accept, (ii) Display, (iii) Concatenation (iv) Compare | 2 | L1,L2,L3 |
| 5 | | Make use of 8086 Trainer kits in:<br>1. Hexkey pad Mode<br>2. Serial Mode | 4 | L1,L2,L3 |
| 6 | | Illustrate Interfacing on Intel 8086 with 8255-Programmable Peripheral Interface. | 2 | L1,L2,L3,L4 |
| 7 | **Advanced Experiments** | Apply Mixed Language Programing to design a calculator. | 2 | L1,L2,L3 |
| 8 | | Develop program to interface mouse driver/keyboard/printer drivers. | 4 | L1,L2,L3,L4 |
| 9 | **Mini/Minor Projects/ Seminar/** | 1. Demonstrate PC-to-PC Communication via RS-232 Serial Port.<br>2. Develop an application on Mixed mode programming.<br>3. Develop an application using Arduino Controller.<br>4. Develop an application using Raspberry-PI. | 6 | L1,L2,L3,L4 |
| 10 | **Case Studies/ Group Presentation** | 1. Compare Multicore processors i3,i5, i7.<br>2. Compare Von Neumann , Hardwired and Data flow architecture<br>3. Recent development in hardware components. | 4 | L1,L2,L3,L4 |
| | | **Total Hours** | **30** | |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: V** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Professional Elective 1(Advanced Operating System) | | | | | | | **Course Code:** PEC-CS5011 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | - | 2@ | 5 | 4 | 25 | 75 | 25 | 25 | **150** |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Computer and Programming Basics | | | | | | | | | |

**Course Objective:** To make students understand and explore the techniques underlying the design and implementation of various concepts of advance operating system.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Demonstrate understanding of design issues of Advanced operating systems and compare different types of operating systems. | L1, L2, L3 |
| 2 | Analyse design aspects and data structures used for file subsystem, memory subsystem and process subsystem of Unix OS | L1, L2, L3, L4 |
| 3 | Demonstrate understanding of different architectures used in Multiprocessor OS and analyse the design and data structures used in Multiprocessor operating systems. | L1, L2, L3, L4 |
| 4 | Differentiate between threads and processes and compare different processor scheduling algorithms used in Multiprocessor OS | L1, L2, L3, L4 |
| 5 | Classify Real Time OS and analyse various real time scheduling algorithms. | L1, L2, L3, L4 |
| 6 | Explore architectures and design issues of Mobile OS,Virtual OS, Cloud OS. | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction**<br>Functions of operating systems, Design approaches: layered, kernel based and virtual machine approach, types of advanced operating systems (NOS, DOS, Multiprocessor OS, Mobile OS, RTOS, Cloud OS) | 4 | L1, L2, L3 |
| 2 | **Unix Kernel and File Management**<br>System Structure, User Perspective, Architecture of Unix Operating System, Buffer cache: Header, Buffer Pool, Retrieving, Reading and Writing Buffer, File Representation: inodes: Structure of file Directories, Path conversion to inode, superblock, inode assignment, allocation of disk blocks | 4 | L1, L2, L3, L4 |
| 3 | **Unix Process and Memory management**<br>Detailed design of Process Structure: Kernel Data structures for process, Structure of Uarea and Process table, Process states and Transitions, Context of a Process: Static and Dynamic area of context, Saving the Context Layout of System Memory, Regions, Mapping regions with Process, page table and mapping virtual address to physical address. | 10 | L1, L2, L3, L4 |
| 4 | **Distributed Operating system concepts**<br>Goals, Distributed Computing Models, Hardware Concepts, Software Concepts, Architecture of DOS. Design Issues: Transparency, Flexibility, Scalability, Reliability, Performance, fault tolerance | 10 | L1, L2, L3, L4 |
| 5 | **Multiprocessor Operating System**<br>Introduction, Basic multiprocessor system architectures, design issues, Threads, Process synchronization: the test and set instruction, the swap instruction, implementation of the process wait, Processor scheduling: Issues, Co-scheduling, Smart scheduling, Affinity Based scheduling | 9 | L1, L2, L3, L4 |
| 6 | **Real Time Operating Systems and Mobile OS**<br>Characteristics of Real Time operating Systems, Classification of Real Time Operating Systems, Scheduling in RTOS: Clock driven cyclic, Event driven: EDF and rate monotonic scheduling. Mobile OS: Architecture, Android OS, iOS, Virtual OS, Cloud OS and their design issues | 8 | L1, L2, L3 |
| | **Total Hours** | **45** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Distributed Systems: Principles and Paradigms | Andrew S. Tanenbaum and Maarten Van Steen | Pearson Education | 2nd edition | 2016 |
| 2 | Real-Time Systems: Theory and Practice | Rajib Mall | Pearson Education India | 1st Edition | 2006 |
| 3 | Operating System: Internals and Design Principles | William Stallings | Prentice Hall | 8th Edition | 2014 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | https://www.geeksforgeeks.org | https://www.geeksforgeeks.org/operating-systems/ | M1-M6 |
| 2 | https://www.tutorialspoint.com | https://www.tutorialspoint.com/operating_system/index.htm | M1-M6 |

## Mini Project Hours Distribution:

| Sr. No | Work to be done | No. of Hours | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Study Research papers and select a mini project topic. | 4 | L1.L2 |
| 2 | Project Title and Modules Identification | 4 | L1,L2 |
| 3 | Design & Methodology | 2 | L1,L2 |
| 4 | Implementation of Module 1 | 4 | L1,L2,L3 |
| 5 | Result Phase I | 4 | L1,L2,L3 |
| 6 | Implementation of Module 2 | 4 | L1,L2 |
| 7 | Result Phase II and Validate Modules | 4 | L1,L2,L3,L4, L5 |
| 8 | Report Writing | 4 | L1,L2 |
| | **Total Hours** | **30** | |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: V** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Professional Elective 1(Mobile Computing) | | | | | | | **Course Code:** PEC-CS5012 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 3 | - | 2@ | 5 | 4 | 25 | 75 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Basics of Programming (Java), Computer Networks | | | | | | | | | |

**Course Objective:** This course introduces the basic concepts and principles in mobile computing. It covers the TCP/IP extensions for mobile networking and provides opportunities to the students to gain hands-on experiences in developing mobile applications.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | RBT level |
|---|---|---|
| 1 | Identify with the basic concepts and principles in mobile computing. | L1, L2 |
| 2 | Understand the components and functioning of mobile networking. | L1, L2, L3 |
| 3 | Describe the technologies in telecommunication with their underlying architectures. | L1, L2 |
| 4 | Explain mobility management | L1, L2, L3 |
| 5 | Illustrate how mobile Ad-hoc networks function | L1, L2, L3 |
| 6 | Implement small android based applications. | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | RBT Levels |
|---|---|---|---|
| 1 | **INTRODUCTION TO MOBILE COMPUTING**<br>Mobile Computing vs. Wireless Networking ; Mobile Computing Applications; Characteristics of Mobile computing;<br>Medium Access Control: Motivation for specialized MAC, Introduction to multiple Access techniques (MACA) , Wireless MAC Issues | 06 | L1,L2 |

| | | | |
|---|---|---|---|
| 2 | **MOBILE IP AND TCP**<br>Mobile IP: IP Packet Delivery, Agent Advertisement and Discovery, Registration, Tunneling and Encapsulation, Reverse Tunneling, Routing (DSDV,DSR)<br>Mobile TCP: Traditional TCP, Classical TCP Improvements (like Indirect TCP, Snooping TCP & Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/Timeout Freezing, Selective Retransmission ) | 09 | L1, L2,L3 |
| 3 | **MOBILE TELECOMMUNICATION SYSTEMS**<br>GSM Mobile services, System Architecture, Radio interface, Protocols , Localization and Calling, Handover, security (A3,A5 & A8);<br>GPRS system and protocol architecture; UTRAN , UMTS core network ; Improvements on Core Network | 07 | L1, L2 |
| 4 | **MOBILITY MANAGEMENT**<br>Co- channel Interference; Mobility: Types of Handoffs; Location Management: HLR-VLR scheme, Hierarchical scheme, Predictive Location management schemes; Cellular IP; PSTN. | 07 | L1, L2, L3 |
| 5 | **MOBILE AD-HOC NETWORKS**<br>Ad-Hoc Networks: Basic Concept, Characteristics , Applications ;Design Issues; Routing :Essential of Traditional Routing Protocols, Popular Routing Protocols; Vehicular Ad Hoc networks ( VANET);MANET Vs VANET; Security in ad-hoc networks | 08 | L1, L2, L3 |
| 6 | **MOBILE APPLICATION DEVELOPMENT**<br>Structure of Mobile Computing Application; Characteristics of mobile devices; Native applications vs. Web-Applications; Internet Protocols for mobile apps; Mobile Platforms: Introduction to Android, Layers, android components, mapping application to process. Android development basics. Hardware tools, Software tools, Android SDK features. | 08 | L1, L2, L3 |
| | **Total hours** | 45 | |

## Books and References:

| S. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Mobile Computing | Raj Kamal | Oxford University Press | Second Edition | 2011 |
| 2 | Mobile Communication | Jochen Schilller | Addision wisely, Pearson Education | Second Edition | 2004 |
| 3 | Fundamentals of Mobile Computing | Pattnaik, Prasant Kumar | PHI Learning Pvt. Ltd. | Second Edition | 2016 |
| 4 | Mobility Protocols and Handover optimization: Design, Evaluation and Application | Ashutosh Dutta, Henning Schulzrinne | IEEE Press, Wiley Publication | First Edition | 2015 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | cse.iitb.ac.in | https://www.cse.iitb.ac.in/~mythili/teaching/cs653_spring2014/index.html | M1, M2, M3 |
| 2 | www.tutorialspoint.com | https://www.tutorialspoint.com/umts/umts_cellular_concepts_mobility_management.htm | M4 |
| 4 | nptel.ac.in | https://nptel.ac.in/courses/106105160/ | M5 |
| 3 | learn.saylor.org | https://learn.saylor.org/course/view.php?id=95&sectionid=978 | M6 |

## Mini Project Hours Distribution

| Sr. No | Work to be done | No. of Hours | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Study articles and research papers: Identification of mini-project title. | 4 | L1.L2,L3 |
| 2 | Finalizing title and identifying different modules to be developed. | 4 | L1,L2,L3 |
| 3 | Design and Methodology: Finalizing design approach and tools for implementation. | 2 | L1,L2,L3 |
| 4 | Implementation of Modules Phase I | 4 | L1,L2,L3 |
| 5 | Result Phase I | 4 | L1,L2,L3,L4 |
| 6 | Implementation of Modules Phase II | 4 | L1,L2,L3 |
| 7 | Result Phase II and Validate Modules | 4 | L1,L2,L3,L4, L5 |
| 8 | Report Writing | 4 | L1,L2,L3 |
| | **Total Hours** | **30** | |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: V** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Professional Elective 1(Advance Database management system) | | | | | | | **Course Code:** PEC-CS5013 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 3 | - | 2@ | 5 | 4 | 25 | 75 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Basics of Database | | | | | | | | | |

**Course Objective:** The objective of the course is to study various Advanced Database concepts like Query Processing, Database Security and to study various Advanced Databases like Distributed Databases, Document Oriented Databases, Temporal, Spatial, Multimedia and Mobile Databases.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Apply appropriate security techniques database systems | L1, L2, L3 |
| 2 | Apply Query Optimization and Measure Query cost | L1, L2, L3 |
| 3 | Describe the concepts of Distributed Database Basics | L1, L2 |
| 4 | Analyze Distributed database for better resource management. | L1, L2, L3, L4 |
| 5 | Demonstrate the understanding of the concepts of Document Oriented Databases. | L1, L2, L3, L4 |
| 6 | Discuss Advanced data models for real life applications | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Data Security**<br>Introduction to Database Security Issues; authorization, Discretionary Access Control Based on Granting and Revoking Privileges, Mandatory Access Control and Role-Based.<br><br>**Access Control for Multilevel Security**<br>● SQL Injection<br>● Introduction to Statistical Database Security, Introduction to Flow Control | 6 | L1, L2, L3 |
| 2 | **Query processing and Optimization**<br>● Overview<br>● Measures of Query cost<br>● Selection operation<br>● Sorting<br>● Join Operations, and other Operations<br>**Evaluation of Expression Query Optimization :**<br>● Translations of SQL Queries into relational algebra<br>● Heuristic approach & cost based optimization | 8 | L1, L2, L3 |
| 3 | **Overview of Distributed Database System**<br>Features and Design Issues of Distributed Databases, Types of Distributed Databases, Distributed Database Architectures. | 6 | L1, L2 |
| 4 | **Distributed Database Design, Transaction, Concurrency and Recovery**<br>Data Fragmentation, Replication, Allocation Techniques in Distributed Databases, Transparencies for Distributed Database Design, Distributed Transaction Management in Distributed Databases, Distributed Concurrency Control (locking), Recovery in Distributed Databases {2PC/3PC) and Deadlock management. | 10 | L1, L2, L3, L4 |
| 5 | **Document Oriented Database**<br>Need of object oriented database, Impedance matching problem between OO languages and Relational database, Case study db4O, Need of Document Oriented database, difference between Document Oriented Database and Traditional database. Types of encoding XML, JSON, BSON, Representation XML, Json Objects. Case study on document Oriented Database | 9 | L1, L2, L3,L4 |
| 6 | **Advanced Data Models**<br>**Temporal data models**:- Aspects of valid time , Bi-temporal time and bi-temporal time with examples of each.<br><br>**Spatial model** :- Types of spatial data models - Raster, Vector and Image<br>**Mobile databases, Multimedia databases.** | 6 | L1, L2 |
| | **Total Hours** | **45** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Fundamentals of Database Systems | Elmasri & Navathe | PEARSON Education. | Seventh Edition | 2016 |
| 2 | Database systems concepts | Korth, Silberschatzsudarshan | McGraw Hill | Seventh Edition | 2016 |
| 3 | Database Management System | Raghu Ramkrishnan & Johannes Gehrke | Tata McGraw-Hill Edition. | Third Edition | -- |
| 4 | Learning MySQL and Mariadb | Ruosell J.T. Dyer | O'Reilly | -- | -- |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.techotopia.com | https://www.techotopia.com/index.php/Mandatory,_Discretionary,_Role_and_Rule_Based_Access_Control | M1 |
| 2 | www.geeksforgeeks.org | https://www.geeksforgeeks.org/sql-query-processing/ | M2 |
| 3 | www.tutorialspoint.com | https://www.tutorialspoint.com/distributed_dbms/distributed_dbms_databases.htm | M3-M6 |

## Mini Project Hours Distribution

| Sr. No | Work to be done | No. of Hours | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Identification and Study of Advanced Database | 8 | L1,L2 |
| 2 | Project Title Identification | 2 | L1,L2 |
| 3 | Graphical User Interface Design | 2 | L1,L2,L3 |
| 4 | Database Design | 2 | L1,L2,L3 |
| 5 | Linking of GUI with Advanced Database | 8 | L1,L2,L3 |
| 6 | Testing of Mini Project | 2 | L1,L2, L3 |
| 7 | Preparation of Report | 6 | L1,L2 |
| | **Total Hours** | **30** | |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E. (Computer Engineering)</td><td colspan="4">T.E. SEM: V</td></tr>
<tr><td colspan="7">Course Name: Professional Elective 1(Multimedia Systems)</td><td colspan="4">Course Code: PEC-CS5014</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>3</td><td>-</td><td>2@</td><td>5</td><td>4</td><td>25</td><td>75</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Computer Fundaments and Graphics</td></tr>
</table>

**Course Objective:** The course should be able to introduce students about basic fundamentals and key aspects of Multimedia system, provide knowledge of compression techniques of different multimedia components, students to understand multimedia communication standards along with technology environment & provide an opportunity to gain hands-on experience in building multimedia applications.

**Course Outcomes: Upon completion of the course students will be able to**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | To identify basics of multimedia and multimedia system architecture. | L1, L2, L3 |
| 2 | To understand different multimedia components | L1, L2 |
| 3 | To explain file formats for different multimedia components. | L1, L2, L3, L4 |
| 4 | To analyze the different compression algorithms. | L1, L2, L3, L4 |
| 5 | To describe various multimedia communication techniques. | L1, L2, L3 |
| 6 | To apply different security techniques in multimedia environment. | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Multimedia System: An Introduction**<br>Multimedia Elements, Multimedia Applications, Multimedia System Architecture, Evolving Technologies for Multimedia Systems, Defining Objects for Multimedia Systems, Multimedia Data Interface Standards, The need for Data Compression, Multimedia Database | 8 | L1, L2, L3 |
| 2 | **Compression & Decompression And Data File format Standards**<br>Types of Compression, Binary Image Compression Schemes<br>Color, Gray Scale and Still Video Image Compression, Video Image Compression, Audio Compression, Rich Text Format, TIFF File Format, Resource Interchange File Format (RIFF), MIDI File Format<br>JPEG DIB File Format for Still and Motion Image, AVI File Format, MPEG Standards | 10 | L1, L2 |
| 3 | **Multimedia Input/output technologies& Storage Retrieval Technologies**<br>Key Technologies Issues, Pen Input, Video and Image Display Systems, Print output Technologies, Image Scanners ,Digital Camera, Video Images and Animation, Full-Motion Video, Magnetic Media Technology<br>Optical Media , Hierarchical Storage Management , Cache Management For Storage Systems | 10 | L1, L2, L3, L4 |
| 4 | **Architectural & Telecommunications Considerations And Multimedia Application Design**<br>Specialized Computational Processors, Memory Systems<br>Multimedia Board Solutions, LAN/WAN Connectivity, Distributed Objects Models, Multimedia Applications Classes, Types of Multimedia System Virtual Reality Design, Components of Multimedia Systems, Distributed Application Design Issues | 8 | L1, L2, L3, L4 |
| 5 | **Multimedia Authoring & User Interface And Hypermedia Messaging**<br>Multimedia Authoring System, Hypermedia Application Design Considerations, User Interface Design, Mobile Messaging, Hypermedia, Message Components, Hypermedia Linking and Embedding, Creating Hypermedia Messages | 5 | L1, L2, L3 |
| 6 | **Distributed Multimedia Systems**<br>Components of a Distributed Multimedia System, distributed Client-Server Operations , Multimedia Object Servers<br>, Multi-server Network Topologies, Distributed Multimedia Databases | 4 | L1, L2, L3, L4 |
| | **Total Hours** | **45** | |

## Books and Reference:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Multimedia Systems Design | Prabhat K Angleigh& Kiran Thakrar | PHI | 1st | 2005 |
| 2 | Multimedia Communication Systems: Techniques, Standards & Networks | K. R. Rao, Zoran S. Bojkovic&Dragorad A. Milovanovic | TMH | 1th | 2010 |
| 3 | Multimedia Systems | K. Buford | PHI | 3rd | 2012 |
| 4 | Fundamentals of Multimedia | Ze-Nian Li & Mark S. Drew | PHI | 2nd | 2011 |
| 5 | Multimedia Computing Communications & Applications, | Ralf Steinmetz & Klara Nahrstedt, | Pearson | 1st | 2012 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.springer.com | https://www.springer.com/gp/book/9783540408673 | M1-M6 |
| 2 | https://books.google.co.in/ | https://books.google.co.in/books?id=34Uuim67mvUC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false | M1-M6 |

## Mini Project Hours Distribution

| Sr. No | Work to be done | No. of Hours | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Study tool for implementation | 2 | L1,L2 |
| 2 | Project Title and Course Identification | 2 | L1,L2 |
| 3 | Choose File Format and Compression techniques | 4 | L1,L2 |
| 4 | Perform task related to compression or Authoring tool | 2 | L1,L2,L3 |
| 5 | Select Authoring tool | 4 | L1,L2,L3 |
| 6 | Design the project using Authoring Tool | 2 | L1,L2 |
| 7 | Design and implement the Authoring System. | 4 | L1,L2,L3,L4 |
| 8 | Design a project in Authoring system | 2 | L1,L2,L3,L4 |
| 9 | Test and Evaluate Model designed in Authoring tool. | 4 | L1,L2,L3,L4,L5 |
| 10 | Prepare report | 4 | L1,L2 |
| | **Total Hours** | **30** | |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: V** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Professional Elective 1(Machine Learning) | | | | | | | **Course Code:** PEC-CS5015 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 3 | - | 2@ | 5 | 4 | 25 | 75 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Linear Algebra, Calculus, Probability, Statistics | | | | | | | | | |

**Course Objective:** The course should be able to introduce Machine Learning techniques and become familiar with its types.

**Course Outcomes: Upon completion of the course students will be able to**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand basics of ML | L1, L2 |
| 2 | Apply pre-processing techniques | L1, L2, L3 |
| 3 | Apply regression for learning and assess the outcome | L1, L2, L3, L4 |
| 4 | Apply classification for learning and assess the outcome | L1, L2, L3, L4 |
| 5 | Apply optimization techniques for performance enhancement | L1, L2, L3, L4 |
| 6 | Apply unsupervised and reinforcement learning concepts and assess the outcome | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Machine Learning**<br>Machine Learning terminology, Types of Machine Learning, Issues in Machine Learning, Application of Machine Learning, Steps in developing ML application, How to choose the right algorithm | 5 | L1, L2 |
| 2 | **Data Preprocessing**<br>Data Transformation, Data Handling (Missing, Imbalanced), Outlier detection and Visualization, Feature selection and extraction | 10 | L1, L2, L3 |
| 3 | **Supervised Learning with Regression**<br>Simple Linear, Gradient Descent, Multiple Linear, Polynomial, Regularization, Evaluation Metric, Use case | 5 | L1, L2, L3, L4 |
| 4 | **Supervised Learning with Classification**<br>k Nearest Neighbor, Logistic Regression, Naïve Bayes, Linear SVM, Kernels, Decision Tree (CART), Issues in DT learning, Ensembles (Bagging – Random Forest, Boosting – AdaBoost), Evaluation Metric, Use case | 13 | L1, L2, L3, L4 |
| 5 | **Optimization Techniques**<br>Model Selection techniques, Cross Validation, Grid Search method | 6 | L1, L2, L3, L4 |
| 6 | **Unsupervised Learning with clustering and Reinforcement Learning**<br>Expectation Maximization algorithm, Use case<br>Elements of Reinforcement Learning, Online Learning (Temporal Difference), Use case | 6 | L1, L2, L3, L4 |
| | **Total Hours** | **45** | |

## Books and Reference:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Machine Learning In Action | Peter Harrington | DreamTech Press | 1st | 2012 |
| 2 | Introduction to Machine Learning | Ethem Alpaydın | MIT Press | 4th | 2020 |
| 3 | Machine Learning | Tom M. Mitchell | McGraw Hill | Indian | 1997 |
| 4 | Machine Learning An Algorithmic Perspective | Stephen Marsland | CRC Press | 2nd | 2011 |
| 5 | Machine Learning — A Probabilistic Perspective | Kevin P. Murphy | MIT Press | 1st | 2012 |
| 6 | Pattern Recognition and Machine Learning | Christopher M. Bishop | Springer | | 2006 |
| 7 | Elements of Statistical Learning | Trevor Hastie, Robert Tibshirani, Jerome Friedman | Springer | 2nd | 2017 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.analyticvidhya.com | https://www.analyticsvidhya.com/%20machine%20learning/ | M1-M6 |
| 2 | www.towardsdatascience.com | https://towardsdatascience.com/machine-learning/home | M1-M6 |
| 3 | www.coursera.org | https://www.coursera.org/learn/machine-learning?utm_source=gg&utm_medium=sem&utm_content=07-StanfordML-IN&campaignid=1950458127&adgroupid=69480953983&device=c&keyword=machine%20learning%20online%20course&matchtype=b&network=g&devicemodel=&adpostion=1t2&creativeid=351281535285&hide_mobile_promo&gclid=Cj0KCQiAn8nuBRCzARIsAJcdIfMYXtdIwVvfyr6ee_ewWcWrBdFmGWrJnWif67PHGt-sEH6r68QbhUoaAvmJEALw_wcB | M1-M6 |

## Mini Project Hours Distribution

| Sr. No | Work to be done | No. of Hours | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Study tool for implementation | 2 | L1,L2 |
| 2 | Project Title and Course Identification | 2 | L1,L2 |
| 3 | Choose Data | 2 | L1,L2 |
| 4 | Perform EDA | 2 | L1,L2,L3 |
| 5 | Perform Feature Engineering | 2 | L1,L2,L3 |
| 6 | Chose Model | 2 | L1,L2 |
| 7 | Train and Validate Model | 2 | L1,L2,L3,L4 |
| 8 | Tune Hyper parameters | 2 | L1,L2,L3,L4 |
| 9 | Test and Evaluate Model | 2 | L1,L2,L3,L4,L5 |
| 10 | Prepare report | 2 | L1,L2 |
| | **Total Hours** | **30** | |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: V** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name** Indian constitution | | | | | | | **Course Code:** MC-CS501 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **25** |
| 1 | - | - | 1 | (Non-Credit) | Passing is mandatory for this course | - | - | 25 | |
| **Prerequisite:** - | | | | | | | | | |

**Course Objectives:** To understand fundamental of Indian constitutional system , Union structure, Judiciary Structure with hierarchy and it function

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Objectives | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the rights and duties of Individual and government | L1, L2 |
| 2 | To understand the government structure and hierarchy | L1, L2 |
| 3 | To understand right of Indian who residing in India or outside India and understand citizenship law | L1, L2 |
| 4 | To understand and apply the personal, social and economic rights to citizens of India | L1, L2, L3 |
| 5 | To analyze the functions and powers of state and its limbs i.e. Legislature, Executive. | L1, L2, L3, L4 |
| 6 | Understand the structure and modalities of state i.e. legislature, executive and judiciary | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1.0 | **Introduction** | 2 | L1, L2 |
| | Constitution' meaning of the term,, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy | | |
| 2.0 | **Union Government and its Administration** | 2 | L1, L2 |
| | Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha | | |
| 3.0 | **Citizenship** | 3 | L1, L2 |
| | Citizenship at the commencement of the Constitution ,Rights of citizenship of certain persons who have migrated to India from Pakistan, Rights of citizenship of certain migrants to Pakistan , Rights of citizenship of certain persons of Indian origin residing outside India , Persons voluntarily acquiring citizenship of a foreign State not to be citizens, Continuance of the rights of citizenship, Parliament to regulate the right of citizenship by law . | | |
| 4.0 | **Fundamental Rights** | 2 | L1, L2, L3 |
| | Definition , Laws inconsistent with or in derogation of the fundamental rights, Right to equality, Right to freedom, Right against exploitation, Right to freedom of religion, Cultural and educational Right , Right to constitution Remedies. | | |
| 5.0 | **The Union** | 3 | L1, L2, L3, L4 |
| | Executive( President & Vice President)<br>General (office of Parliament)<br>Conduct of Business | | |
| 6.0 | **The Union Judiciary** | 3 | L1, L2, L3, L4 |
| | Establishment and constitution of Supreme Court Salaries | | |
| | **Total** | **15** | |

## Books and References:

| S. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | The Constitution of India | Bare Act | Government of India | NA | 2020 |
| 2 | Introduction to the Constitution of India | D.D. Basu | Lexis Nexis | 24th Edition | 2019 |
| 3 | Indian Constitutional Law | M.P Jain | Lexis Nexis | 8th Edition | 2018 |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E.( Computer Engineering)** | | | | | | **SEM: VI** | | |
|---|---|---|---|---|---|---|---|---|
| **Course Name: Summer Internship** | | | | | | **Course Code:** SI-CS501 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | |
| **Total Hours : Maximum 2 Weeks ( 60 to 80 Hours during summer vacation)** | | | | | | | **TW** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | - | - | - | - |
| - | - | - | 160 * - 240* | 4*-6* | | | | |

**Note :**

1. Internship will be done in institute laboratory in collaboration with industries.
2. Evaluation and assessment will be done as per AICTE guidelines.

**Prerequisite:** Fundamental knowledge of respective programmes

## Course Objectives:

To get industry like exposure in the institute laboratories by carrying out activities / projects. Also design innovative techniques / methods to develop the products.

## Course Outcomes: Upon completion of the course students will be able to:

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Apply subjects knowledge in the college laboratories for carrying out projects | L3, L4,L5 |
| 2 | Developed innovative techniques / methods to develop the products | L3, L4,L5 |
| 3 | Contribute for the society | L3, L4,L5 |

**Detailed Syllabus:**

| Module No. | Topics | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | **Program Specific Internship**<br>• Training and certification on emerging technologies in domains offered by Department of Computer Engineering<br>• Applying classroom and laboratory knowledge to design , develop and deploy the products | L3, L4,L5 |
| 2 | **Inter disciplinary Internship**<br>• To explore and understand issues and challenges in the other disciplines (EXTC, ELEX, MECH and CIVIL)<br>• Design , develop and deploy cost effective products using multidisciplinary approach | L3, L4,L5 |
| 3 | **Industry Specific Internship**<br>• To explore and understand issues and challenges in industry<br>• Developing solutions for industry specific problems<br>• Design , develop and deploy products for startup and SMEs | L3, L4,L5 |
| 4 | **Interpersonal Internship**<br>• To develop interpersonal skills such as leadership, marketing ,publicity and corporate ethics and communication<br>• To get competence in problem solving , presentation , negotiation skills | L3, L4,L5 |
| 5 | **Social Internship**<br>• Identify and study different real life issues in the society<br>• Identify societal problems and provide engineering solutions to solve these problems | L3, L4,L5 |
| 6 | **Academic Internship**<br>• Study report preparation, preparation of presentations, copy table book preparation , business proposal and IPR<br>• Capture aspirations & expectations through interviews of students.<br>• Ways to connect research in technical institutes with industry.<br>• Taking inputs from self, local stakeholders and global stake holders which will help to develop process with comparative and competitive study. | L3, L4,L5 |

**Books and References:**

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | The Ultimate Guide to Internships: 100 Steps to Get a Great Internship and Thrive in It (Ultimate Guides) | Eric Woodard | Allworth | I | 2015 |

**Online References:**

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| **1** | https://www.letsintern.com/ | https://www.letsintern.com/internships/summer-internships | M1-M6 |
| 1 | https://codegnan.com | https://codegnan.com/blog/benefits-of-internships-and-importance | M1-M6 |
| 2 | https://www.honorsociety.org | https://www.honorsociety.org/articles?category=internships | M1-M6 |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="5">B.E. (Computer Engineering)</td><td colspan="3">T.E. SEM: V</td></tr>
<tr><td colspan="5">Course Name Professional Skill V (Web Development)</td><td colspan="3">Course Code: HSD-CSPS501</td></tr>
<tr><td colspan="4">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="4">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="4">Conducted in the beginning of Semester during first 3 Weeks</td><td>Presentation</td><td>Report</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>AC</td><td>AC</td><td rowspan="2">75</td></tr>
<tr><td>15</td><td>-</td><td>30</td><td>45</td><td>2</td><td>50</td><td>25</td></tr>
<tr><td colspan="8">AC- Activity evaluation<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="8">Prerequisite: Computer Basics, Java</td></tr>
</table>

**Course Objectives:** By the end of the course students will be able to design and implement static and dynamic websites.

## Course Outcomes: Upon completion of the course students will be able to

| S.N. | Course Outcomes | Cognitive level attainment as per revised Bloom's Taxonomy |
|---|---|---|
| 1 | Understand different components in web technology and to know about web servers. | L1, L2 |
| 2 | Develop an interactive Web pages using HTML/XHTML. | L1, L2, L3, L4 |
| 3 | Present a professional document using Cascaded Style Sheets. | L1, L2, L3, L4 |
| 4 | Construct websites for user interactions using JavaScript and JQuery. | L1, L2, L3, L4, L5 |
| 5 | Know the different information interchange formats like XML and JSON. | L1, L2, L3, L4 |
| 6 | Develop Web applications using PHP. | L1, L2, L3, L4, L5 |

## Detailed Syllabus:

| Module No. | Topics | Cognitive level attainment as per revised Bloom's Taxonomy |
|---|---|---|
| 1 | **Introduction to the Internet** | L1, L2 |
| | The World Wide Web, Web Browsers, Uniform Resource Locators, WWW Architecture – SMTP – POP3 – File Transfer Protocol<br>The Hypertext Transfer Protocol, HTTP request – response — Generation of dynamic web pages- W3C Validator, How web works - Setting up the environment (LAMP/XAMP/WAMP server) | |
| 2 | **HTML/XHTML** | L1, L2, L3, L4 |
| | Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables Images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5, Syntactic Differences between HTML and XHTML | |
| 3 | **Introduction to Cascading Style Sheets** | L1, L2, L3, L4 |
| | Cascading Style Sheets: Levels of Style Sheets - Style Specification Formats, Selector Forms, Property-Value Forms, Font Properties, List Properties, Alignment of Text, Color, The Box Model, Background Images, The span and div Tags. | |
| 4 | **Introduction to JavaScript** | L1, L2, L3, L4, L5 |
| | Introduction: client-side scripting-First program: Displaying a Line of Text-JavaScript Alert-Dynamic Page-Web Application-Variables in JavaScript-Data Types in JavaScript-Operators and Expressions-Simple If Statement- If Else Statement- Nested If Else Statement-Switch Case-For Loop-While Loop-Functions-Events-Arrays-Objects –Math and Date in JavaScript-Redirect to Another HTML Page | |
| 5 | **Introduction to Data Interchange Formats** | L1, L2, L3, L4 |
| | XML: The Syntax of XML, XML Document Structure, Namespaces, XML Schemas, Displaying Raw XML Documents, Displaying XML Documents with CSS, XSLT Style Sheets, XML Applications.<br>JSON(Basics Only): Overview, Syntax, Datatypes, Objects, Schema, Comparison with XML | |
| 6 | **Introduction to PHP and MySQL** | L1, L2, L3, L4, L5 |
| | Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin and database bugs | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Internet &World Wide Web How to Program | P. J. Deitel, H.M. Deitel | Pearson education | 4th Edition, | 2010 |
| 2 | Programming the World Wide Web | Robert W Sebesta | Pearson education | 7th Edition, | 2014 |
| 3 | HTML 5 | DT Editorial services | Dreamtech Press | 2nd Edition | 2016 |
| 4 | Web Technologies Black Book | Kogent Learning Solutions | Dreamtech Press | 2nd Edition | 2016 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | W3schools | https://www.w3schools.com | M1-M6 |
| 2 | Tutorialspoint | https://www.tutorialspoint.com | M1-M6 |
| 3 | Javatpoint | https://www.javatpoint.com | M1-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | Basic Experiments | Explain Installation steps to LAMP / WAMP / XAMP. | 2 | L1 |
| 2 | | Sketch Simple web page using HTML5 | 2 | L1, L2 |
| 3 | Design Experiments | Develop web page using CSS3 and HTML5. | 2 | L1, L2, L3 |
| 4 | | Develop a Javascript web page illustrating functions and events | 2 | L1, L2, L3 |
| 5 | | Develop simple web page using PHP functions. | 2 | L1, L2, L3 |
| 6 | | Develop XML web page using DTD, XSL. | 2 | |
| 7 | Advanced Experiments | Develop a login page using PHP. | 4 | L1, L2, L3 |
| 8 | | Develop interactive web pages using PHP with database connectivity MYSQL. | 4 | L1, L2, L3 |
| 9 | Mini/Minor Projects/ Seminar/ | 1. Online Second-hand Book Buying & Selling Portal<br>2. College E Print Service Management<br>3. Online Pizza Ordering System | 6 | L1, L2, L3 |
| 10 | Case Studies/ Group Presentation | 1. Study on MYSQL database<br>2.Study on different built-in methods of JavaScript<br>3. Comparative study on Angular JS and Node JS | 4 | L1, L2, L3 |
| | **Total Hours** | | **30** | |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | **T.E. SEM: V** | |
|---|---|---|---|---|---|---|---|
| **Course Name** Project Based Learning - III | | | | | | **Course Code:** HSD-CSPBL501 | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | |
| **Conducted in the beginning of Semester during first 3 Weeks** | | | | | **Presentation** | **Report** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **AC** | **AC** | **25** |
| - | - | 30 | 30 | 1 | 25 | - | |
| AC- Activity evaluation<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely Completion of practical (40%) and Attendance/Learning Attitude (20%) | | | | | | | |
| **Prerequisite:** Computer Fundamentals and Knowledge of Programming Languages | | | | | | | |

**Course Objective:** The Course intends to aid students identify real world problems and apply computing fundamental and technical skill to find solutions to them.

## Course Outcomes: Upon completion of the course students will be able to:

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Interpret the basic real time problems. | L1, L2 |
| 2 | Apply appropriate technologies and programming constructs to solve problems. | L1, L2, L3 |
| 3 | Inspect the results obtained for documentation and presentation. | L1, L2, L3, L4 |

## Projects Listing:

| Sr. No. | Title of Project | Type of Project |
|---|---|---|
| 1 | Implementing Online School Administration System | Application |
| 2 | Implementing Employee Transport Management System | Application |
| 3 | Implementing Online Course and Examination System | Application |
| 4 | Implementation of Online Secondhand Book Buying and Selling Portal | Application |
| 5 | Implementing Online Logistics Chatbot System | Application |
| 6 | Implementation of Online Newspaper Delivery Management System | Application |
| 7 | Design Online Health Shopping Portal with Product Recommendation | Core |
| 8 | Design Web-based Chat Application with webcam using PHP | Core |
| 9 | Design Internet based Discussion Forum | Core |
| 10 | Develop Customer targeted E-Commerce | Core |

**T.E. Semester –V**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | **T.E. SEM: V** | |
|---|---|---|---|---|---|---|---|
| **Course Name** Research Based Learning-I | | | | | | **Course Code:** HSD-CSRBL501 | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | |
| **Conducted in the beginning of Semester during first 3 Weeks** | | | | | **Presentation** | **Report** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **AC** | **AC** | **50** |
| - | - | 30 | 30 | 1 | 25 | 25 | |
| AC- Activity evaluation | | | | | | | |
| **Prerequisite:** Mathematical Foundation, Computing Methods | | | | | | | |

**Course Objectives:** This course is focused to engage the learner in research by upgrading domain knowledge by participation in technical quiz and debate, critical thinking, innovative idea generation and technical writing.

**Course Outcomes: Upon completion of the course students will be able to:**

| S.N. | Course Outcome | Cognitive level attainment as per revised Bloom Taxonomy |
|---|---|---|
| 1 | Upgrade the knowledge of latest technologies in their discipline in a competitive environment. | L1, L2 |
| 2 | Create new idea for problem solving related to industry or societal issues. | L1, L2, L3 |
| 3 | Understand research methodologies. | L1, L2, L3, L4 |
| 4 | Students will be able to write a technical paper. | L1, L2, L3, L4, L5 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive level attainment as per revised Bloom Taxonomy |
|---|---|---|---|
| 1 | **Technical Quiz and Technical Debate**<br>I. Quiz competition on technical topics from different domains with 50 MCQ (Questions will vary according to department).<br>II. Formation of 8 teams for four topics. 2 teams (For and Against) for topic I will debate first and the other teams will be audience.<br>III. | 8 | L1, L2 |

| | | | |
|---|---|---|---|
| 2 | **Idea generation with design thinking aspects and related literature survey**<br>I. Introduction to design thinking and its stages.<br>II. Formation of groups, generation of an idea and conducting literature survey. | 7 | L1, L2, L3 |
| 3 | **Proof of concept and validation of idea through survey**<br>**Seminar on Research methodology**<br>I. Validate the idea by conducting the survey (through Google docs, interviews or any other suitable method).<br>II. Seminar on different research methods and procedures for 8designing and conducting scientific research. | 8 | L1, L2, L3,L4 |
| 4 | **Paper writing skills (Seminar/workshop)**<br>**Documentation of Selected Idea and its validation**<br>I. Seminar or workshop on paper writing skills.<br>II. Write a research paper on idea generated. | 7 | L1, L2, L3,L4,L5 |
| | **Total Hours** | **30** | |

## References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1. | Writing Research Papers: A Complete Guide | James D. Lester | Longman | 10th | 2001 |
| 2. | Creativity in Product Innovation | Jacob Goldenberg | Cambridge University Press | Kindle | 2002 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1. | https://www.geeksforgeeks.org | https://www.geeksforgeeks.org/tag/c-quiz-references/ | M1 |
| 2. | Interaction Design Foundation: Design Thinking | https://www.interaction-design.org/literature/topics/design-thinking | M2 |
| 3. | Scribbr: How to write a research methodology. | https://www.scribbr.com/dissertation/methodology/ | M3 |
| 4. | https://www.statpac.com | https://www.statpac.com/online-software-manual/Basic-Research-Concepts.htm | M4 |
| 5. | https://www.slideshare.net | https://www.slideshare.net/AsirJohnSamuel/1introduction-to-research-methodology?next_slideshow=1 | M4 |

# T.E. Semester – VI

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

| **B.E. ( Computer Engineering )** | | | | | | | | | | | **SEM :** VI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Name :** Soft Skills and Interpersonal Communication | | | | | | | | | | | **Course Code** : HSMC-CS601 |
| **Contact Hours Per Week :** 03 | | | | | | | | | | | **Credits** : 03 |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment/ Evaluation** | | | | | | |
| **Hours Per Week** | | | | | **Theory (50)** | | **Practical/Oral** | | **Term Work (25)** | | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **IA** | **ESE** | **IA** | **ESE** | **100** |
| 3 | - | - | 3 | 3 | 25 | 75 | - | - | - | - | |
| **MSA:** Mid Semester Assessment- Paper Duration – **1.5 Hour**<br>**ESE :** End Semester Examination- Paper Duration - **2 Hours**<br>Mid Semester Assessment for Term work will be on continuous basis | | | | | | | | | | | |
| **Prerequisite-** Basic knowledge of English language, Grammar and Vocabulary | | | | | | | | | | | |

**Course Objectives**:

| Sr. No. | Course Objectives | RBT level |
|---|---|---|
| 1 | To understand basics of soft skills | L1,L2,L3 |
| 2 | To learn essential life skills | L1,L2,L3 |
| 3 | To develop intrapersonal skills | L1,L2,L3 |
| 4 | To develop interpersonal Skills | L1,L2,L3 |
| 5 | To learn career and employment skills. | L1,L2,L3 |
| 6 | To develop corporate ethics and etiquette. | L1,L2,L3 |

**Course Outcomes:**

| Sr. No. | Course Outcomes | RBT Levels |
|---|---|---|
| 1 | Understand basics of soft skills | L1,L2,L3 |
| 2 | Learn essential life skills | L1,L2,L3 |
| 3 | Understand and develop self | L1,L2,L3 |
| 4 | Understand others with empathy | L1,L2,L3 |
| 5 | Use employment skills for placement and higher studies | L1,L2,L3 |
| 6 | Incorporate ethics and etiquette in day to day life | L1,L2,L3 |

**Detailed Syllabus:**

| Module No. | Topics | Lectures | RBT Levels |
|---|---|---|---|
| 1.0 | **Introduction to Soft Skills**<br>1.1 Meaning and Concept<br>1.2 Importance of soft Skills<br>1.3 Soft Skills for Lifelong learning- Building a better world | 6 | L1,L2,L3 |
| 2.0 | **Essential Soft Skills**<br>2.1 Personal integrity<br>2.2 Taking responsibility<br>2.3 Professionalism<br>2.4 Communication<br>2.5 Critical Thinking<br>2.6 Creativity and Innovation | 8 | L1,L2,L3 |
| 3.0 | **Self-Development**<br>3.1 Self-assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem.<br>3.2 Personal memory<br>3.3 Rapid reading & Taking notes<br>3.4 Complex problem solving<br>3.5 Creativity | 8 | L1,L2,L3 |
| 4.0 | **Introduction to Interpersonal Skills**<br>4.1 Team work: Mentorship, Motivation<br>4.2 Problem Solving<br>4.3 Decision Making<br>4.4 Time Management<br>4.5 Emotional Intelligence<br>4.6 Negotiation Skills<br>4.7 Stress Management | 8 | L1,L2,L3 |
| 5.0 | **Employability Skills**<br>5.1 Cover letter<br>5.2 Resume<br>5.3 Group Discussion<br>5.4 Presentation skills<br>5.5 Interview skills | 8 | L1,L2,L3 |
| 6.0 | **Introduction to Corporate Ethics and Etiquette**<br>6.1 Business etiquette (meeting etiquette, Dining etiquette, Interview etiquette, Professional and work etiquette and Social Skills)<br>6.2 Greetings and art of conversation<br>6.3 Dressing and grooming<br>6.4 Ethical codes of conduct in business Intonation Pattern for effective presentation | 7 | L1,L2,L3 |
| **Number of Lectures** | | **45** | |

**Suggested List of Practical/ Experiments: NA**

**Practical Outcomes: NA**

**Books and References:**

| Sr. No | Name of the Book | Name of the Author | Publisher | Edition | Year of Publication |
|---|---|---|---|---|---|
| 1 | Practical English Usage | Michael Swan | OUP | 4th Edition | 1995 |
| 2 | Remedial English Grammar | F.T. Wood | Macmillan | 2014 Edition | 2007 |
| 3 | Pocket Style Manual | Diane Hacker | Bedford publication, New York | 2003 Edition (ISBN 0312406843) | 2003 |
| 4 | You Can Win | Shiv Khera | Macmillan Books, New York | 2003 Edition | 2003 |
| 5 | Technical Writing & Professional Communication for non-native speakers of English | Thomas N. Huckin & Leslie A. Olsen | McGraw Hill Education | 2011 Edition | 2011 |
| 6 | The 7 Habits of Highly Effective People | Stephen Covey | Free Press | 2016 Edition | 2016 |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. ( Computer Engineering )** | | | | | | | **T.E. SEM: VI** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :** Cryptography & System Security | | | | | | | **Course Code :** PCC-CS601 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 3 | 1 | 2 | 6 | 5 | 25 | 75 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Computer Networks | | | | | | | | | |

**Course Objectives:** The objective of the course is to introduce classical encryption techniques to explore the working principles and utilities of various cryptographic algorithms, the design issues of various authentication protocols and to build programs for secure communication.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Illustrating various system security goals and concepts, classical encryption techniques and acquire fundamental knowledge on the concepts of modular arithmetic and number theory. | L1, L2, L3, L4 |
| 2 | Illustrate and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication | L1, L2, L3, L4 |
| 3 | Evaluate the knowledge of cryptographic checksums and performance of different message digest algorithms for verifying the integrity of varying message sizes. | L1, L2, L3, L4 |
| 4 | Analyze different digital signature algorithms to achieve authentication and design secure applications | L1, L2, L3, L4 |
| 5 | Analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP. | L1, L2, L3, L4 |
| 6 | Analyze and apply system security concept to recognize malicious code. | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction & Number Theory**<br>Security Goals, Services, Mechanisms and attacks, Classical Encryption techniques, Symmetric cipher model, mono-alphabetic and polyalphabetic substitution techniques: Vigenere cipher, Playfair cipher, transposition techniques: keyed and keyless transposition ciphers, steganography. Modular Arithmetic and Number Theory, Euclid's algorithm-–Prime numbers-Fermat's and Euler's theorem | 9 | L1, L2, L3, L4 |
| 2 | **Symmetric and Asymmetric key Cryptography and key Management**<br>Block cipher principles, block cipher modes of operation, DES, Double DES, Triple DES, Advanced Encryption Standard (AES), Stream Ciphers: RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm, The knapsack algorithm, Diffie Hellman Key exchange algorithm. | 11 | L1, L2, L3, L4 |
| 3 | **Hashes, Message Digests and Digital Certificates**<br>Cryptographic hash functions, Properties of secure hash function, MD5, SHA-1, MAC, HMAC, and CMAC. Digital Certificate: X.509, PKI | 4 | L1, L2, L3, L4 |
| 4 | **Authentication Protocols & Digital signature schemes**<br>User Authentication and Entity Authentication, One-way and mutual authentication schemes, Needham Schroeder Authentication protocol, Kerberos Authentication protocol. Digital Signature Schemes – RSA schemes. | 10 | L1, L2, L3, L4 |
| 5 | **Network Security and Applications**<br>Network security basics: TCP/IP vulnerabilities (Layer wise), Packet Sniffing, ARP spoofing, port scanning, IP spoofing, TCP syn flood, DNS Spoofing. Denial of Service: Classic DOS attacks, Source Address spoofing, ICMP flood, SYN flood, UDP flood, Distributed Denial of Service, Defenses against Denial of Service Attacks. Internet Security Protocols: SSL, IPSEC, Secure Email: PGP, Firewalls, IDS and types, Honey pots | 11 | L1, L2, L3, L4 |
| 6 | **System Security**<br>Software Vulnerabilities: Buffer Overflow, Format string, cross-site scripting, SQL injection, Malware: Viruses, Worms, Trojans, Logic Bomb, Bots, Rootkits. | 7 | L1, L2, L3, L4 |
| | **Total Hours** | **52** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Cryptography and Network Security, Principles and Practice | William Stallings, | Pearson Education, | Sixth Edition | 2013 |
| 2 | Cryptography & Network Security | Behrouz A. Ferouzan, | Tata Mc Graw Hill | Third Edition | 2007 |
| 3 | Cryptography & Network Security | Bernard Menezes | Cengage Learning | Second Edition | 2012 |
| 4 | Network Security Bible | Eric Cole | Wiley | Second Edition | 2009 |
| 5 | Applied Cryptography, Protocols Algorithms and Source Code in C, | Bruce Schneier | Wiley | Second Edition | 1996 |
| 6 | Cryptography and Network Security | Atul Kahate | Tata Mc Graw Hill. | Eighth Edition | 2006 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.tutorialspoint.com | https://www.tutorialspoint.com/cryptography/ | M1,M2,M3,M4 |
| 2 | www.engineering.purdue.edu | https://engineering.purdue.edu/kak/compsec/NewLectures/Lecture16.pdf | M5 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | a.) Understand the use of network reconnaissance tools like WHOIS, dig, trace route, nslookup to gather information about networks and domain registrars.<br>b.) Analyze the tool nmap and use it with different options to scan open ports, perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, xmas scan etc. | 2 | L1, L2, L3 |
| 2 | | Implement and design the product cipher using Substitution and Transposition ciphers. | 2 | L1, L2, L3, L4 |
| 3 | **Design Experiments** | Analyze and implement RSA cryptosystem and Digital signature scheme using RSA/El Gamal | 2 | L1, L2, L3, L4 |
| 4 | | Analyze and implement Diffie-Hellman Key exchange algorithm | 2 | L1, L2, L3, L4 |
| 5 | | Implement the following using the packet sniffer tools: wireshark,<br>a.) Download and install wireshark and capture icmp, tcp, and http packets in promiscuous | 2 | L1, L2, L3, L4 |

| | | | | |
|---|---|---|---|---|
| | | mode.<br>b.) Explore how the packets can be traced based on different filters. | | |
| 6 | | Analyze the performance and implement for varying message sizes, test integrity of message using MD-5, SHA-1 using crypt APIs | 4 | L1, L2, L3, L4 |
| 7 | | a.) Illustrate DOS attack using Hping, hping3 and other tools.<br>b.) Illustrate ARP spoofing using nmap and/or open source tool ARPWATCH and wireshark. Use arping tool to generate gratuitous arps and monitor using wireshark. | 4 | L1, L2, L3, L4 |
| 8 | | SQL injection attack, Cross-site Scripting attack simulation | 4 | L1, L2, L3, L4 |
| 9 | **Case Studies** | Setting up personal Firewall using iptables | 4 | L1, L2, L3, L4 |
| 10 | | Design a Security System for any infrastructure area. | 4 | L1, L2, L3, L4 |
| | | **Total Hours** | **30** | |

## List of Tutorials:

| Sr. No. | Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Tutorial on Classical Encryption Techniques | 1 | L1, L2, L3 |
| 2 | Tutorial on Symmetric Cipher Model, Monoalphabetic and Polyalphabetic Substitution Techniques | 3 | L1, L2, L3 |
| 3 | Tutorial on Keyed and Keyless Transposition Ciphers. | 2 | L1, L2, L3 |
| 4 | Tutorial on Modular Arithmetic and Number Theory. | 1 | L1, L2, L3 |
| 5 | Tutorial on Euclid's Algorithm–Prime Numbers-Fermat's and Euler's Theorem. | 1 | L1, L2, L3 |
| 6 | Tutorial on Public Key Cryptographic Algorithm: RSA Algorithm. | 2 | L1, L2, L3 |
| 7 | Tutorial on Public Key Cryptographic Algorithm: The Knapsack Algorithm. | 2 | L1, L2, L3 |
| 8 | Tutorial on Diffie Hellman Key Exchange Algorithm. | 1 | L1, L2, L3 |
| 9 | Tutorial on Man-in-the Middle Attack on Diffie Hellman Key Exchange Algorithm. | 1 | L1, L2, L3 |
| 10 | Tutorial on Hash Functions. | 1 | L1, L2, L3 |
| | **Total Hours** | **15** | |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: VI** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** System Programming and Compiler Construction | | | | | | | **Course Code**: PCC-CS602 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 3 | - | 2 | 5 | 4 | 25 | 75 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Theoretical Computer Science, Discrete Structure, Operating System | | | | | | | | | |

**Course Objective:** The Objective of this course is to compare the role and functioning of various system programs over application program, understand the role of various system programs from program development to program execution and design of Assemblers, Macro processor, Linker, Loader, Compiler.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Identify and use of various System and Application software for program development. | L1, L2, L3 |
| 2 | Design and develop Assemblers and Macro processors. | L1, L2, L3 |
| 3 | List various functions of loader and describe various loading scheme. | L1, L2 |
| 4 | Illustrate the working of compiler and design and develop hand written and automatic lexical analyzer. | L1, L2, L3 |
| 5 | Apply various parsing techniques to design new language structures with the help of grammars. | L1, L2, L3 |
| 6 | Apply code optimization techniques to optimize intermediate code and generate target machine code. | L1,L2,L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Overview of System Software**<br>**Introduction to System Software** with examples, Software Hierarchy, Differentiate between system software and application software.<br>**Introduction to Language Processors**: Compiler, Assembler, Interpreter. | 4 | L1, L2, L3 |
| 2 | **Assemblers and Macro Processors**<br>**Assemblers:** Elements of Assembly Language Programming, Basic Assembler functions , Design of the Assembler, Types of Assemblers, Two pass assembler – IBM 360/370, Format of databases, Algorithm ,Single pass Assembler for Intel x86.<br>**Macro Processors:** Macros, Basic Functions of Macro Processor, Features of Macro Facility, Design of Two pass Macro Processor, Format of Databases and Algorithm. | 10 | L1,L2, L3 |
| 3 | **Linkers and Loaders**<br>**Linkers:** Introduction, Relocation of Linking Concept, Design of a Linker.<br>**Loaders:** Loader and Function of Loader, Loader schemes, Design of Direct linking loader. | 5 | L1,L2 |
| 4 | **Introduction to Compilers and Lexical Analysis**<br>**Introduction to Compilers**: Design issues, passes, phases.<br>**Lexical Analysis:** The Role of a Lexical analyzer, Input buffering, specification and recognition of tokens, Automatic construction of lexical analyzer using LEX | 4 | L1, L2,L3 |
| 5 | **Parsing**<br>**Syntax Analysis**: The Role of Parser, Top down parsing- Predictive parsers (LL), Bottom Up parsing - Operator precedence parsing, SLR, LR (1), LALR, automatic construction of parsers using YACC.<br>**Introduction to Semantic Analysis:** Need of semantic analysis, type checking and type conversion | 12 | L1, L2, L3 |
| 6 | **Compilers: Synthesis Phase**<br>**Syntax Directed Translation and Intermediate Code Generation:** Attribute grammar, S and L attributed grammar, bottom up and top down evaluations of S and L attributed grammar, Intermediate code – need, Types of Intermediate codes, and Implementation of Three address codes.<br>**Code Optimization:** Need and sources of optimization, Code optimization techniques: Machine Dependent and Machine Independent.<br>**Code Generation**: Issues in the design of code generator, code generation algorithm. Basic block and flow graph. | 10 | L1, L2,L3 |
| | **Total Hours** | **45** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Systems Programming | J. J. Donovan | Tata McGraw Hill | NA | 1991 |
| 2 | Systems programming | D. M Dhamdhere | Tata McGraw Hill | 2nd Edition | 1996 |
| 3 | Compilers Principles, Techniques and Tools | A. V. Aho, R. Shethi, Monica Lam , J.D. Ulman | Pearson Education | 2nd Edition | 2006 |
| 4 | Compiler construction : principles and practices | Kenneth C.Louden | CENGAGE Learning | 1st Edition | 1997 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.stanford.edu | https://online.stanford.edu/courses/soe-ycscs1-compilers | M3-M6 |
| 2 | nptel.ac.in | https://swayam.gov.in/nd1_noc20_cs13/preview | M3-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Apply first and follow rules to compute First () and Follow() set of given grammar. | 2 | L1, L2, L3 |
| 2 | | Apply various optimization techniques to optimize intermediate code. | 2 | L1, L2, L3 |
| 3 | **Design Experiments** | Design and develop two pass Assembler. | 2 | L1, L2, L3 |
| 4 | | Design and develop two pass Macro Processor. | 2 | L1, L2, L3 |
| 5 | | Design and develop a hand written Lexical Analyzer. | 2 | L1, L2, L3 |
| 6 | | Design and develop Intermediate Code Generator using 3-Address code. | 2 | L1, L2, L3 |
| 7 | | Design and develop a Lexical Analyzer using LEX / Flex tool | 4 | L1, L2, L3 |
| 8 | | Design and develop calculator using YACC tool. | 2 | L1, L2, L3 |
| 9 | **Case study:** | 1. Optimizing Compiler<br>2. Compiler Construction Open Source Tools<br>3. Java Compiler<br>4. Cross Compiler | 4 | L1, L2,L3,L4 |
| 10 | **Mini Project:** | 1. Design and development of editor.<br>2. Design and Development of Linker and Loader.<br>3. Design and development of Predictive Parser.<br>4. Design and Development of LR parser. | 8 | L1, L2, L3,L4 |
| | | **Total Hours** | **30** | |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E.(Computer Engineering)</td><td colspan="4">T.E. SEM: VI</td></tr>
<tr><td colspan="7">Course Name: Advanced Algorithm</td><td colspan="4">Course Code: PEC-CS6011</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>3</td><td>-</td><td>2@</td><td>5</td><td>4</td><td>25</td><td>75</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Introduction to Algorithms</td></tr>
</table>

**Course Objective:** The Objective of this course is to teach advanced algorithms and data structures to solve complex problems in real life applications.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Describe analysis techniques for algorithms. | L1, L2 |
| 2 | Identify appropriate data structure and design techniques for different problems | L1, L2 |
| 3 | Identify appropriate algorithm to be applied for the various application like geometric modeling, robotics, networking, etc. | L1, L2 |
| 4 | Appreciate the role of probability and randomization in the analysis of algorithm. | L1, L2, L3 |
| 5 | Analyze various algorithms. | L1, L2, L3 |
| 6 | Differentiate polynomial and non-deterministic polynomial algorithms. | L1, L2, L3, L4 |

**Detailed Syllabus:**

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Fundamental of Algorithms**<br>Introduction- 08 Complexity-complexity of recursive algorithms, finding complexity by tree method, master method, proving technique (contradiction, mathematical induction). | 8 | L1, L2 |
| 2 | **Probabilistic Analysis and Randomized Algorithm**<br>The hiring problem Indicator random variables Randomized algorithms Probabilistic analysis . | 8 | L1,L2 |
| 3 | **Maximum Flow**<br>Flow networks , the ford Fulkerson method ,max bipartite 08 matching , push Relabel Algorithm , The relabel to front algorithm. | 8 | L1,L2 |
| 4 | **Advanced Data Structure**<br>Introduction to trees and heap Red-Black Trees: properties of red-black trees , Operations on Red-black trees Binomial Heaps: Binomial trees and binomial heaps, Operation on Binomial heaps Analysis of all above operations | 12 | L1, L2,L3 |
| 5 | **Computational Geometry**<br>Line Segment properties, Determining whether any pair of segment intersects, finding the convex hull, Finding the closest pair of points. | 5 | L1, L2, L3 |
| 6 | **NP Completeness**<br>NP-Completeness: NP-Completeness and reducibility, NP- 08 Completeness proofs, NP-Complete problems-The vertexcover problem, The travelling salesman problem | 4 | L1, L2, L3,L4 |
| | **Total Hours** | **45** | |

**Books and References:**

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | **Introduction to Algorithms** | Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein | PHI, India | 2nd | 2020 |
| 2 | Fundamentals of Computer Algorithms | Horowitz, Sahani and Rajsekaran | O'Reilly | 2nd Edition | 2016 |
| 3 | Algorithms – Design and Analysis | Harsh Bhasin | Oxford | - | 2015 |
| 4 | Randomized Algorithm | Rajeev Motwani, Prabhakar Raghavan | Cambridge University | 2nd Edition | 2014 |

**Online References:**

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.coursera.org | https://www.coursera.org/browse/computer-science/algorithms | M1,M2,M4, M5,M6 |
| 2 | www.coursera.org | https://www.coursera.org/specializations/data-structures-algorithms | M3,M4,M6 |
| 2 | nptel.ac.in | https://nptel.ac.in/courses/106/105/106105164/ | M3,M4,M6 |

**Mini Project Hours Distribution:**

| Sr. No | Work to be done | No. of Hours | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Study different algorithms approaches | 6 | L1, L2 |
| 2 | Project Title finalization | 2 | L1, L2 |
| 3 | Problem definition and design | 4 | L1, L2 |
| 4 | Proposed method architecture | 4 | L1, L2, L3 |
| 5 | Deployment | 8 | L1, L2, L3 |
| 6 | Testing and Evaluation | 4 | L1, L2, L3, L4 |
| 7 | Prepare report | 6 | L1, L2, L3, L4 |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: VI** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name: Internet Programming** | | | | | | | **Course Code:** PEC-CS6012 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 3 | - | 2@ | 5 | 4 | 25 | 75 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Basics of programming, Basics of Networks | | | | | | | | | |

**Course Objective:** To understand different Internet Technologies and to learn java-specific web services architecture.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand and Use HTML5 and CSS3 | L1, L2,L3 |
| 2 | Comprehend Client side programming | L1, L2, L3 |
| 3 | Implement server side scripting | L1,L2, L3 |
| 4 | Understand the main concepts of PHP | L1,L2,L3 |
| 5 | Explain why XML is used and describe its syntax | L1, L2, L3 |
| 6 | Explain the basics of AJAX and Web Services | L1, L2,L3,L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **WEB ESSENTIALS** | 6 | L1, L2,L3 |
| | Clients, Servers and Communication-The Internet-Basic Internet protocols-World wide web-HTTP Request/Response Message-Web Clients/Servers-HTML5-Tables-Lists-Images-HTML5:control elements-Semantic elements -Drag and Drop -Audio -Video controls - CSS3-Inline, embedded and external style sheets-Rule cascading-Inheritance-Backgrounds-Border Images-Colors-Shadows-Text-Transformations-Transitions- Animations. | | |

| | | | |
|---|---|---|---|
| 2 | **CLIENT SIDE PROGRAMMING** | 8 | L1, L2, L3 |
| | Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL. | | |
| 3 | **SERVER SIDE PROGRAMMING** | 8 | L1,L2, L3 |
| | Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies-Installing and Configuring Apache Tomcat Web Server- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example – JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code. | | |
| 4 | **PHP** | 8 | L1,L2,L3 |
| | An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation- Regular Expressions – File handling – Cookies – Connecting to Database. | | |
| 5 | **XML** | 7 | L1, L2, L3 |
| | XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM). | | |
| 6 | **INTRODUCTION TO AJAX and WEB SERVICES** | 8 | L1, L2,L3,L4 |
| | AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP. | | |
| | **Total Hours** | **45** | |

**Books and References:**

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Internet and World Wide Web - How to Program | Deitel and Nieto | Prentice Hall | 5th | 2011 |
| 2 | Web Technologies A Computer Science Perspective | Jeffrey C and Jackson | Pearson Education | 1st | 2011 |
| 3 | Web Technology | Gopalan N.P. and Akilandeswari J | Prentice Hall of India | - | 2011 |
| 4 | Web Programming – Building Intranet Applications | Chris Bates | Wiley Publications | 3rd | 2009 |

**Online References:**

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.w3school.com | https://datasheetspdf.com/pdf/544568/Intel/8086/1 | M1-M6 |
| 2 | Tutorialpoints.com | https://nptel.ac.in/courses/106108100/ | M1,M2 |
| 3 | https://www.codecademy.com/ | https://www.codecademy.com/ | M1-M3 |

**Mini Project Hours Distribution:**

| Sr. No | Work to be done | No. of Hours | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Study tool for implementation | 4 | L1, L2 |
| 2 | Project Title Identification | 2 | L1, L2 |
| 3 | Decide major modules of the project | 2 | L1, L2 |
| 4 | Designing of UI | 2 | L1, L2, L3 |
| 5 | Implementation phase 1 | 4 | L1, L2, L3 |
| 6 | Testing phase 1 | 4 | L1, L2, L3, L4 |
| 7 | Implementation phase 2 | 4 | L1, L2, L3, L4 |
| 8 | Testing phase 2 | 4 | L1, L2, L3, L4 |
| 9 | Prepare report | 4 | L1, L2 |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | | **T.E. SEM: VI** | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :** Data Warehousing and Mining | | | | | | | | **Course Code :** PEC-CS6013 | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 3 | - | 2@ | 5 | 4 | 25 | 75 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Basic concepts of Database and algorithm design and analysis | | | | | | | | | |

**Course Objective:** The course should be able to introduce methods and theory for development of data warehouses and data analysis using data mining and familiarize students with pre-processing of data, modelling and design of data warehouses, algorithms for classification, clustering and association rule analysis.

**Course Outcomes: Upon completion of the course students will be able to**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand fundamentals of Data warehouse and Dimensional modelling | L1, L2, L3, L4 |
| 2 | Design data warehouse with dimensional modelling and apply OLAP operations | L1, L2, L3, L4, L5 |
| 3 | Apply appropriate data mining algorithms to solve real world problems | L1, L2, L3, L4, L5 |
| 4 | Compare and evaluate different data mining techniques like classification, prediction and clustering | L1, L2, L3, L4, L5 |
| 5 | Apply association rule mining technique on large dataset | L1, L2, L3, L4, L5 |
| 6 | Describe complex data types with respect to spatial and web mining | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Data Warehouse and Dimensional modelling**<br>Introduction to Strategic Information, Need for Strategic Information, Features of Data Warehouse, Data warehouses versus Data Marts, Top-down versus Bottom-up approach. Data warehouse architecture, metadata, E-R modelling versus Dimensional Modelling, Information Package Diagram, STAR schema, STAR schema keys, Snowflake Schema, Fact Constellation Schema, Factless Fact tables, Update to the dimension tables, Aggregate fact tables | 8 | L1, L2, L3, L4 |
| 2 | **ETL Process and OLAP**<br>Major steps in ETL process, Data extraction: Techniques, Data transformation: Basic tasks, Major transformation types, Data Loading: Applying Data, OLTP Vs OLAP, OLAP definition, Dimensional Analysis, Hypercubes, OLAP operations: Drill down, Roll up, Slice, Dice and Rotation,<br>OLAP models : MOLAP, ROLAP, HOLAP | 6 | L1, L2, L3, L4, L5 |
| 3 | **Introduction to Data Mining, Data Exploration and Preprocessing**<br>Data Mining Task Primitives, Architecture, Techniques, KDD process, Issues in Data Mining, Applications of Data Mining, Data Exploration :Types of Attributes, Statistical Description of Data, Data Visualization, Data Preprocessing: Cleaning, Integration, Reduction: Attribute subset selection, Histograms, Clustering and Sampling, Data Transformation & Data Discretization: Normalization, Binning, Concept hierarchy generation, Concept Description: Attribute oriented Induction for Data Characterization. | 9 | L1, L2, L3, L4, L5 |
| 4 | **Classification, Prediction and Clustering**<br>Basic Concepts, Decision Tree using Information Gain, Induction: Attribute Selection Measures, Tree pruning, Bayesian Classification: Naive Bayes, Classifier Rule - Based Classification: Using IFTHEN Rules for classification, Prediction: Simple linear regression, Multiple linear regression Model Evaluation & Selection: Accuracy and Error measures, Holdout, Random Sampling, Cross Validation, Bootstrap, Clustering: Distance Measures, Partitioning Methods (k-Means, k-Medoids), Hierarchical Methods(Agglomerative, Divisive) | 12 | L1, L2, L3, L4, L5 |
| 5 | **Mining Frequent Patterns and Association Rules**<br>Market Basket Analysis, Frequent Item sets, Closed Item sets, and Association Rule, Frequent Pattern Mining, Efficient and Scalable Frequent Item set Mining Methods: Apriori Algorithm, Association Rule Generation, Improving the Efficiency of Apriori, FP growth, Mining frequent Item sets using Vertical Data Format, Introduction to Mining Multilevel Association Rules and Multidimensional Association Rules | 6 | L1, L2, L3, L4, L5 |
| 6 | **Spatial and Web Mining**<br>Spatial Data, Spatial Vs. Classical Data Mining, Spatial Data Structures, Mining Spatial Association and Co-location Patterns, Spatial Clustering Techniques: CLARANS Extension, Web Mining: Web Content Mining, Web Structure Mining, Web Usage mining, Applications of Web Mining | 4 | L1, L2, L3 |
| | **Total Hours** | **45** | |

## Books and Reference:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Data Warehousing Fundamentals for IT Professionals | Paulraj Ponniah | Wiley | Second | 2010 |
| 2 | Data Mining Concepts and Techniques | Jiawei Han, Micheline Kamber, Jian Pei | Morgan Kaufmann | Third | 2011 |
| 3 | Data warehousing | ReemaTheraja | Oxford University press | Fourth | 2009 |
| 4 | Data Mining Introductory and Advanced Topics | Margaret H. Dunham | Prentice Hall/Pearson Education | First | 2003 |

## online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.nptel.ac.in | https://onlinecourses.nptel.ac.in/noc20_cs12/preview | M3 – M6 |
| 2 | www.coursera.org | https://www.coursera.org/learn/dwdesign | M1, M2 |
| 3 | www.coursera.org | https://www.coursera.org/specializations/data-mining | M3 – M6 |

## Mini Project Hours Distribution:

| Sr. No | Work to be done | No. of Hours | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Study tool for implementation | 4 | L1, L2 |
| 2 | Project Title Identification | 2 | L1, L2 |
| 3 | Choose Data | 2 | L1, L2 |
| 4 | Data Preparation and Analysis | 4 | L1, L2, L3 |
| 5 | Perform Feature Engineering | 2 | L1, L2, L3 |
| 6 | Model selection | 2 | L1, L2, L3, L4 |
| 7 | Train and Validate Model | 6 | L1, L2, L3, L4 |
| 8 | Test and Evaluate Model | 4 | L1, L2, L3, L4, L5 |
| 9 | Prepare report | 4 | L1, L2 |
| | **Total Hours** | **30** | |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. (Computer Engineering)** | | | | | | | **T.E. SEM: VI** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Digital Signal Processing | | | | | | | **Course Code:** PEC-CS6014 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 3 | - | 2@ | 5 | 4 | 25 | 75 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Basic Mathematics and signals systems | | | | | | | | | |

**Course Objective:** The objective of this course is to understand the basic concept of DT Signal, perform signal manipulation, Compute Convolution and Correlation operations and illustrate DFT and FFT algorithms

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No | Course Outcome | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the concept of DT Signal and perform signal manipulation. | L1, L2, L3, L4, L5 |
| 2 | Analyze the DT system in time domain. | L1, L2, L3, L4 |
| 3 | Evaluate DTFT and DFT of signals in time domain. | L1, L2, L3, L4, L5 |
| 4 | Develop and sketch FFT flow-graph. | L1, L2, L3, L4, L5 |
| 5 | Evaluate Fast DSP Algorithms. | L1, L2, L3, L4, L5 |
| 6 | Understand the concept of digital filters | L1, L2 |

**Detailed Syllabus:**

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Discrete Time Signal**<br>Introduction to Digital Signal Processing, Discrete Time Signals, Continuous Signals, Sampling and Reconstruction, Standard DT Signals, Concept of Digital Frequency, Representation of DT signal using Standard DT Signals, Mathematical Operations on Signal (shifting, addition, subtraction, multiplication), Classification of Signals, Linear Convolution formulation (without mathematical proof), Circular Convolution formulation (without mathematical proof), Matrix Representation of Circular Convolution, Linear by Circular Convolution. Auto and Cross Correlation formula evaluation. | 12 | L1, L2, L3, L4, L5 |

| | | | |
|---|---|---|---|
| 2 | **Discrete Time System**<br>Introduction to Discrete Time System, Classification of DT Systems (Linear/Non Linear, Causal/Non Causal, Time Invariant/Time Variant Systems, Stable/ Unstable), BIBO Time Domain Stability Criteria. LTI system, Concept of Impulse Response and Step Response | 8 | L1, L2, L3, L4 |
| 3 | **Discrete Fourier Transform**<br>Introduction to DTFT, DFT, Relation between DFT and DTFT, Properties of DFT without mathematical proof (Scaling and Linearity, Periodicity, Time Shift and Frequency Shift, Time Reversal, Convolution Property and Parseval's Energy Theorem). DFT computation using DFT properties. Transfer function of DT System in frequency domain using DFT.<br>Linear and Circular Convolution using DFT, Introduction to 2-D DFT | 10 | L1, L2, L3, L4, L5 |
| 4 | **Fast Fourier Transform**<br>Radix-2 DIT-FFT algorithm, DIT-FFT Flowgraph for N=4, 6 & 8, Inverse 06 FFT algorithm. Spectral Analysis using FFT, Comparison of complex and real, multiplication and additions of DFT and FFT. | 8 | L1, L2, L3, L4, L5 |
| 5 | **DSP Algorithms**<br>Fast Circular Convolution Algorithm, Fast Linear Convolution Algorithm, Convolution of long sequences (Overlap Add and Overlap Save Method) | 6 | L1, L2, L3, L4, L5 |
| 6 | **Digital Filters and Applications of DSP**<br>Introduction to digital Filters, Concept of IIR filter and FIR filter, Case study of Real Time DSP applications to Speech Signal Processing and Biomedical Signal Processing. | 4 | L1, L2 |
| | **Total Hours** | **48** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Digital Signal Processing | A. Anand Kumar | PHI Learning Pvt. Ltd. | Second Edition | 2013 |
| 2 | Digital Signal Processing | Nagoor Kani | McGraw Hill Education; | 2 edition | (1 July 2017) |
| 3 | Digital Signal Processing: Principles, Algorithms, and Applications | John G. Proakis, Dimitris and G.Manolakis | Pearson Education | Fourth Edition | 2007 |
| 4 | Digital Signal Processing | Salivahanan | McGraw Hill Education; | Third edition | (1 July 2017) |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.tutorialspoint.com | https://www.tutorialspoint.com/digital_signal_processi ng/ | M1, M2, M3, M4, M5, M6 |
| 2 | www.gnits.ac.in | https://www.gnits.ac.in/sites/default/files/ONLINERES OURCES/ECE/dsp.pdf https://lecturenotes.in/subject/44/digital-signalprocessing-dsp | M1, M2, M3, M4, M5, M6 |
| 3 | www.dss.tf.uni-kiel.de/ | https://dss.tf.uni-kiel.de/images/teaching/lectures/advanced_digital_signal_processing/slides/adsp_05_digital_filters.pdf | M6 |

## Mini Project Hours Distribution:

| Sr. No | Work to be done | No. of Hours | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Study tool/techniques used for implementation | 4 | L1, L2 |
| 2 | Project Title Identification | 2 | L1, L2 |
| 3 | Choose Dataset and Algorithm | 2 | L1, L2 |
| 4 | Data Preparation and Analysis | 4 | L1, L2, L3 |
| 5 | Perform Feature Engineering | 2 | L1, L2, L3 |
| 6 | Application selection | 2 | L1, L2, L3, L4 |
| 7 | Train and Validate application | 6 | L1, L2, L3, L4 |
| 8 | Test and Evaluate application | 4 | L1, L2, L3, L4, L5 |
| 9 | Prepare report | 4 | L1, L2 |
| | **Total Hours** | **30** | |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E.(Computer Engineering)** | | | | | | | **T.E. SEM: VI** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name: Soft Computing** | | | | | | | **Course Code:** PEC-CS6015 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | - | 2@ | 5 | 4 | 25 | 75 | 25 | 25 | **150** |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Introduction to Discrete Mathematics | | | | | | | | | |

**Course Objective:** The Objective of this course is to Soft computing concepts like fuzzy logic, neural networks and genetic algorithm, where Artificial Intelligence is mother branch of all.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | To introduce the ideas of soft computational techniques based on human experience. | L1, L2 |
| 2 | To generate an ability to design, analyze and perform experiments on real life problems using various Neural Learning Algorithms. | L1, L2 |
| 3 | To conceptualize fuzzy logic and its implementation for various real world applications. | L1, L2 |
| 4 | To apply the process of approximate reasoning using Neuro-Fuzzy Modeling. | L1, L2, L3 |
| 5 | To provide the mathematical background to carry out optimization using genetic algorithms. | L1, L2, L3 |
| 6 | To introduce basics of genetic algorithm. | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Soft Computing**<br>Neural Networks: Definition, Advantages, Applications, Scope. Fuzzy logic: Definition, Applications. Hybrid System: computing Definition, Types of Hybrid Systems, Applications. Genetic Algorithms: Definition, Applications. | 4 | L1, L2 |

| | | | |
|---|---|---|---|
| 2 | **Artificial Neural Networks**<br>Fundamental Concepts and Models of Artificial Neural Systems: Biological Neurons and Their Artificial Models, Models of Artificial Neural Networks, Neural Processing, Learning and Adaptation, Neural Network Learning Rules and Comparison. Linearly and Non-Linearly Separable Pattern Classification. Perceptron Convergence Theorem. Multi-layer Feedforward Network: Delta Learning Rule for Multiperceptron Layer, Generalized Delta Learning Rule, Feedforward Recall and Error Back-propagation Training, Learning Factors, Character Recognition Application. | 18 | L1,L2 |
| 3 | **Fuzzy Set Theory**<br>Brief Review of Conventional Set Theory, Introduction to Fuzzy Sets, Properties of Fuzzy Sets, Operations on Fuzzy Sets, Membership Functions.Fuzzy Extension Principle, Fuzzy Relations, Projection and Cylindrical Extension of Fuzzy Relations, Fuzzy Max-Min and Max-Product Composition. Fuzzy Knowledge Based Systems with Applications, Defuzzification Methods, Fuzzy Composition Rules, Architecture of Mamdani Type Fuzzy Control Systems. | 8 | L1,L2 |
| 4 | **Hybrid Systems**<br>ANFIS: Adaptive Neuro-Fuzzy Inference Systems: Introduction, 4 ANFIS Architecture, and Hybrid Learning Algorithm | 8 | L1, L2,L3 |
| 5 | **Genetic Algorithm**<br>Biological Background, Traditional optimization and search techniques, genetic algorithm and search space, genetic algorithm vs. traditional algorithms, basic terminologies, simple genetic algorithm, general genetic algorithm, operators in genetic algorithm, stopping condition for genetic algorithm flow, constraints in genetic algorithm, problem solving using genetic algorithm | 4 | L1, L2, L3 |
| 6 | **Introduction to Artificial Intelligence**<br>Introduction and Definition of Artificial Intelligence.<br>Intelligent Agents : Agents and Environments ,Rationality, Nature of Environment, Structure of Agent, types of Agent | 3 | L1, L2, L3,L4 |
| | **Total Hours** | **45** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Principles of Soft Computing | S.N.Sivanandam, S.N.Deepa | Wiley Publication. | 2nd Edition | 2005 |
| 2 | Neural Networks, Fuzzy Logic and Genetic Algorithms | S.Rajasekaran and G.A.VijayalakshmiPai | PHI Learning. | 3rd Edition | 2008 |
| 3 | Artificial Intelligence | Rob Callan | Palgrave macmillan | 1st Edition | 2003 |
| 4 | Artificial Intelligence a Modern Approach | Stuart J. Russell and Peter Norvig | McGraw Hill | 3rd Edition | 2009 |
| 5 | A First Course in Artificial Intelligence | Deepak Khemani | McGraw Hill Education (India) | 1st Edition | 2013 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | nptel.ac.in | https://nptel.ac.in/courses/106102220/ | M1-M6 |
| 2 | nptel.ac.in | https://onlinecourses.nptel.ac.in/noc20_cs81/preview | M1-M4, M6 |
| 2 | www.coursera.org | https://www.coursera.org/learn/introduction-to-ai/ | M1 |

**Mini Project Hours Distribution:**

| Sr. No | Work to be done | No. of Hours | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Study different soft computing methods | 6 | L1, L2 |
| 2 | Project Title finalization | 2 | L1, L2 |
| 3 | Problem definition and design | 4 | L1, L2 |
| 4 | Proposed method architecture | 4 | L1, L2, L3 |
| 5 | Deployment | 8 | L1, L2, L3 |
| 6 | Testing and Evaluation | 4 | L1, L2, L3, L4 |
| 7 | Prepare report | 6 | L1, L2, L3, L4 |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="5">B. E (Computer Engineering)</td><td colspan="4">T.E. SEM : VI</td></tr>
<tr><td colspan="5">Course Name : Digital Marketing</td><td colspan="4">Course Code : OEC-CS6011</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>25</td><td>75</td><td>-</td><td>-</td></tr>
<tr><td colspan="9">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="9">Prerequisite: Marketing Fundamentals, Digital Assets, Digital System Setup and automation</td></tr>
</table>

**Course Objective:** The course will transform you into a complete digital marketer with expertise in the top eight digital marketing domains — search engine optimization, social media, pay-per-click, conversion optimization, digital analytics, content, mobile, and email marketing. Fast-track your career in digital marketing today with practical training you can apply on the job.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand Digital Business Models | L1,L2 |
| 2 | Understand A.I. and machine learning terminologies, mind-set and its application in marketing | L1,L2 |
| 3 | Build sophisticated machine learning models – learn how to gather and clean data, select an algorithm, train, evaluate and deploy a model | L1,L2 |
| 4 | Predict churn, sales or score leads with tools | L1,L2,L5 |
| 5 | Segment customers; build clustering models to drive personalization. | L1,L2,L5,L6 |
| 6 | Build computer vision models for social visual listening, use natural language processing to predict consumption preferences. | L2,L5 |

**Detailed Syllabus:**

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction - Digital Marketing**<br>Digital Marketing Skills empowered by AI :SEO, Search Engine Marketing, Social Media Marketing, Web Analytics, Email Marketing, Content Marketing, Influencer Marketing, Conversion Rate Optimization, Tools Based Marketing, Lifecycle Marketing Automation. | 7 | L1,L2 |
| 2 | **Full Funnel Marketing**<br>**Acquisition:** Content marketing, landing page testing, campaign optimization, conversion rate optimization, lead scoring, competition and trend analysis, predict sales, optimize product pricing, programmatic media buying, segmentation and clustering for targeting, personalization.<br>**Activation**<br>Personalization, psychographic segmentation, behavioral segmentation<br>**Retention**<br>Predict churn, customer care chatbot, sentiment analysis, visual social listening, personalization<br>**Revenue**<br>Predict and maximize customer lifetime value, recommender systems, market basket analysis<br>**Referral**<br>Predict whether user recommend your product | 8 | L1,L2,L3 |
| 3 | **Marketing framework and tools**<br>**Planning:**Hubspot, Brightedge, Node, Crayon, Equals3, Marketmuse, Pathmatics, Calibermind, Alegion, Netra<br>**Production** : Acrolinx, Narrative Science,Clarifai, GumGum, phrasee, curate Attentioninsight<br>**Personalization** : Uberflip, Klevu, Seventh Sense, Blueshift,<br>**Promotion** : Yext, Albert, Onespot, Cortex, Siftrock, inPowered,<br>**Performance :**Monkeylearn, PaveAI, | 8 | L1,L2,L3,L5 |
| 4 | **Predictive Analytics**<br>Fundamentals of predictive analytics,<br>Prediction model for lead scoring and sales forecasting, churn prediction model,<br>Predictive modelling for customer behaviour, automated segmentation | 7 | L1,L2,L3,L5 |
| 5 | **Psychographics, NLP and Computer Vision**<br>Customer psychographics, leveraging personality traits to predict consumption preferences using NLP, Detect emotions, assign labels, understand text from images, detect news events, logos using Computer Vision | 7 | L1,L2,L3,L5 |
| 6 | **Futuristic Marketing**<br>IoTs Augmented Reality, Virtual Reality and XR for Marketing, Blockchain and smart contracts for marketing, NeuroMarketing, Wearable Tech, Personal Chatbots | 8 | L2,L3 |
| | **Total Hours** | **45** | |

**Books and References:**

| Sr. No | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Artificial intelligence marketing and predicting consumer choice: an overview of tools and techniques | Struhl, S. | Kogan Page Publishers | Third | 2017 |
| 2 | AI for Marketing and Product Innovation: Powerful New Tools for Predicting Trends, Connecting with Customers, and Closing Sales. | Appel, A., Sthanunathan, S., Pradeep, A. K. | Wiley. | Third | 2018 |
| 3 | Artificial intelligence for marketing: practical applications | Sterne, J. | John Wiley & Sons | Fourth | 2017.. |
| 4 | Using Artificial Intelligence in Marketing: How to harness AI and maintain the competitive edge. | King, K. | Kogan Page Publishers | First | 2019 |

**Online References:**

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | https://www.iimcal.ac.in/ | https://iimcal.talentsprint.com/ai-powered-marketing/index.html?utm_source=googlesearch&utm_medium=cpc&utm_campaign=iimc-aipm-googlesearch-india&utm_content=ai-in-marketing-by-iimc&gclid=CjwKCAjwyo36BRAXEiwA24CwGVQrXnOTpcARRsFtvt8b9VAPqwV7KGPFmPyx36i1Zafl_7Br1OJEEhoChC4QAvD_BwE/ | M1,M2,M3,M4,M5,M6 |
| 2 | https://www.coursera.org/ | https://www.coursera.org/learn/uva-darden-market-analytics | M4,M5,M6 |
| 3 | https://academy.hubspot.com/ | https://academy.hubspot.com/courses/artificial-intelligence-and-machine-learning-in-marketing?__hstc=89107140.de4401799f3edce1fd42a1704a37ab4a.1598174195879.1598174195879.1598174195879.1&__hssc=89107140.1.1598336323938&__hsfp=3825083997&hsCtaTracking=e4d097a0-ed0c-4f82-8e93-e9016ea31749%7C00439f3d-17bf-4431-af12-50a507004fcd | M1,M2,M3,M4,M5,M6 |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="3">T.E. SEM: VI</td></tr>
<tr><td colspan="7">Course Name :Entrepreneurship Development and Management</td><td colspan="3">Course Code : OEC-CS6012</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="5">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="5">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>25</td><td>75</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hour<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: entrepreneurial mindset</td></tr>
</table>

**Course Objective:** The course should be able to inculcate, advance, and groom entrepreneurial skills into the students aspiring to establish and successfully run an enterprise.

**Course Outcomes: Upon completion of the course students will be able to**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Recognize an overview of basic entrepreneurship concepts | L1, L2 |
| 2 | Design a business plan and understand importance of capital | L1, L2, L3, L4, L5, L6 |
| 3 | Discuss the rules and legislation w.r.t. entrepreneurship | L1, L2 |
| 4 | Identify sources for organizational assistance in this field | L1, L2 |
| 5 | Use knowledge gained for effective management of business | L1, L2, L3 |
| 6 | Recognize ways of achieving success in business | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Overview of Entrepreneurship**<br>Definition, Importance, Roles and Functions, Evolution of term 'Entrepreneurship', Factors influencing Entrepreneurship, Characteristics of an Entrepreneur, of Types of Entrepreneur, Contribution of Government Agencies in Sourcing information for Entrepreneurship, Role of Entrepreneurship in the National Economy | 5 | L1, L2 |
| 2 | **Business Plans and importance of capital to Entrepreneurship**<br>Preliminary and Marketing Plans, Management and Personnel, Start-up Costs and Financing as well as Projected Financial Statements, Legal Section, Insurance, Suppliers and Risks, Assumptions and Conclusion, Capital and its Importance to the Entrepreneur<br>Entrepreneurship And Business Development: Starting a New Business, Buying an Existing Business, New Product Development, Business Growth and the Entrepreneur Law and its Relevance to Business Operations | 10 | L1, L2, L3, L4, L5, L6 |
| 3 | **Rules and Legislation**<br>Applicability of Legislation, Industries Development (Regulations) Act, 1951, Factories Act, 1948, The Industrial Employment (Standing Orders) Act, 1946, West Bengal Shops and Establishment Act, 1963, Environment (Protection) Act, 1986, The sale of Goods Act, 1950, Industrial Dispute Act 1947 | 6 | L1, L2 |
| 4 | **Organization Assistance**<br>Assistance to an entrepreneur, New Ventures, Industrial Park (Meaning, features, & examples), Special Economic Zone (Meaning, features & examples), Financial assistance by different agencies, MSME Act Small Scale Industries, Carry on Business (COB) license, Environmental Clearance, National Small Industries Corporation (NSIC), Government Stores Purchase scheme (e-tender process), Excise exemptions and concession, Exemption from income tax, Quality Standards with special reference to ISO, Financial assistance to MSME, Modernization assistance to small scale unit, The Small Industries Development Bank of India (SIDBI), The State Small Industries Development Corporation (SSIDC), Export oriented units, Shilpabandhu-M Incentives for entrepreneurs, Other agencies for industrial assistance, Directorate General of Supplies and Disposals(DGS & D), Khadi and Village Industries Commission (KVIC), Industrial Estate | 11 | L1, L2 |
| 5 | **Effective Management of Business**<br>Issues and problems faced by micro and small enterprises and effective management of M and S enterprises (risk management, credit availability, technology innovation, supply chain management, linkage with large industries), exercises, e-Marketing<br>Women Entrepreneurship Development, Social entrepreneurship-role and need, EDP cell, role of sustainability and sustainable development for SMEs, case studies, exercises | 8 | L1, L2, L3 |
| 6 | **Achieving success in small business**<br>Stages of the small business life cycle, four types of firm-level growth strategies, Options – harvesting or closing small business Critical Success factors of small business | 5 | L1, L2 |
| | **Total Hours** | **45** | |

## Books and Reference:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Entrepreneurship Development and Management | Dr. A. K. Singh | Laxmi Pub. Ltd. | | 2009 |
| 2 | Entrepreneur and Entrepreneurship | Mohd Asif Hasan | | | |
| 3 | Small Business and Entrepreneurship | S. Anil Kumar | I. K. International pvt. Ltd. | | 2008 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.nptel.ac.in | https://nptel.ac.in/courses/110/106/110106141/ | M1-M6 |
| 2 | www.coursera.org | https://www.coursera.org/specializations/wharton-entrepreneurship | M1-M6 |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **B.E. ( Computer Engineering )** | | | | | | | **T.E. SEM : VI** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :** Software Process Automation | | | | | | | **Course Code :OEC-CS6013** | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | - | - | 3 | 3 | 25 | 75 | - | - | **100** |
| **IA: In-Semester Assessment - Paper Duration – 1.5 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Object Oriented Programming, Frontend Backend connectivity | | | | | | | | | |

## Course Objective:

The objective of the course is to introduce to the students about the integration people involved in the software process with the development and tools required for automation of the project development.

## Course Outcomes: Upon completion of the course students will be able to:

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the importance of process automation and models of software process | L1, L2 |
| 2 | Analyze the security and configuration management | L1, L2, L3,L4 |
| 3 | Understand and apply the build concepts using a build tool | L1, L2, L3,L4 |
| 4 | Understand the testing concepts and apply them to the project | L1, L2, L3,L4 |
| 5 | Identify the activities in agile project management and use a tool for the same | L1, L2, L3,L4 |
| 6 | Understand and identify the various principles of quality assurance | L1, L2, L3,L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to process Automation**<br>Importance of process automation, types of models, prescriptive and descriptive models, Devops model, process modelling objectives and goals | 6 | L1, L2,L3 |
| 2 | **Automation of config management**<br>overview of configuration management, Github and git tool | 8 | L1, L2, L3,L4 |

| | | | |
|---|---|---|---|
| 3 | **Build automation**<br>Overview of build management, Jenkins tool for build management | 4 | L1, L2, L3,L4 |
| 4 | **Test automation**<br>Overview of testing concepts, test cases , selenium tool | 8 | L1, L2, L3 |
| 5 | **Project management**<br>Project management concepts, agile team, Atlasian jira project management tool | 8 | L1, L2, L3,L4 |
| 6 | **Quality management**<br>Quality concepts and metrics, CMMI, ISO, spice, six sigma, Total Quality management | 11 | L1, L2, L3,L4 |
| | **Total Hours** | **45** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | The DevOps handbook | Gene Kim, Jez Humble, Ptrik Debois & John Willis | IT revolution Press | first Edition | 2016 |
| 2 | Selenium WebDriver 3 Practical Guide: End-to-end Automation Testing for Web and Mobile Browsers with Selenium WebDriver | Satya Avasarala | Packt Publishing Ltd, | Second Edition | 2018 |

## Online Resources:

| S. No. | Website Name | /URL | Modules Covered |
|---|---|---|---|
| 1 | www,researchgate,com | https://www.researchgate.net/publication/258865356_Software_Process_Definition_and_Management | M6 |

# T.E. Semester –VI

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

| **BE (Computer Engineering )** | | | | | | | **T.E. (SEM :** VI) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :Essence of Traditional Indian Knowledge** | | | | | | | **Course Code :** MC-CS601 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Presentation (25)** | **Term work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **AC** | **AC** | **25** |
| 1 | -- | -- | 1 | Non credit | -- | -- | -- | 25 | |
| **AC-** Activity Evaluation<br>**Total weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely Completion of Practical (40%) and Attendance/ Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite: History, Value Education, Moral Science** | | | | | | | | | |

**Course Objective:** The course aims at imparting basic principles of thought process, reasoning and inferencing with focus on sustainability as the core of Indian Traditional knowledge Systems connecting society and nature. It also focuses on Holistic life style of yogic science and wisdom important in modern society with rapid technological advancements and societal disruptions with an introduction to Indian Knowledge Systems, Indian philosophical traditions, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system..

**Course Outcomes: Upon completion of the course student will be able to:**

| S.No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Develop knowledge of trade and commerce in classical and medieval India. | L1, L2 |
| 2 | Correlate the understanding of Indian Knowledge System with modern Science. | L1, L2, L3 |
| 3 | Develop the knowledge of Ancient Indian science and technology and India's contribution to the world. | L1, L2 |
| 4 | Know and analyse the effects of colonization on Indian culture and civilization. | L1, L2, L3,L4 |
| 5 | Understand the role and position of women in traditional and modern Indian society | L1, L2 |
| 6 | Develop the knowledge of Globalization and growth of India Economy since Independence. | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction**<br>Ancient India –– Classical India – Dharma as the bedrock of Indian society – Trade and commerce in classical and medieval India and the story of Indian supremacy in the Indian ocean region; | 2 | L1, L2 |
| 2 | **Basic structure of Indian Knowledge System**<br>The vedas, the vedic society and the Sanatana Dharma, classical sanskrit literature –<br>Modern Science and Indian Knowledge System -Yoga and Holistic Health care<br>Indian Philosophy – the orthodox (Vaidika) and the heterodox (atheistic) schools; Ramayana and Mahabharata; Bhagavad Gita; | 3 | L1, L2 |
| 3 | **India's contribution to the world: spirituality, philosophy and Sciences**<br>Saints and sages of India; Ancient Indian medicine: towards an unbiased perspective; Ancient Indian mathematics; Ancient Indian astronomy; Ancient Indian science and technology. | 2 | L1, L2, L3 |
| 4 | **Indian economy – before and after colonization:**<br>What attracted the rest of the world to India?; India on the eve of the arrival of European merchants; The story of colonization and the havoc it wrecked on Indian culture and civilization; Macaulay and the start of the distortion of Indian education and history; a brief survey;<br>The emergence of modern India. | 3 | L1, L2, L3 |
| 5 | **Women in Indian society**<br>The role and position of women in Hindu civilization; Gleanings from the Vedas, Brihadarnyaka Upanishad, Saptasati Devi Mahatmyam, Ramayana, Mahabharata, Manusmriti, Kautilya'sArthasastra and<br>Mrichchhakatikam of Sudraka; The role and position of Indian women. | 3 | L1, L2, L3 |
| 6 | **Modern India**<br>The national movement for freedom and social emancipation; Swami Vivekananda, Sri Aurobindo, Rabindranath Tagore; Understanding Mahatma Gandhi; A new nation is born as a republic – the pangs of birth and growth; India since Independence – the saga of socio- political movements; Problems facing the nation today; Globalization<br>and Indian Economy; Bharatavarsha today and the way ahead: Regeneration of Indian National Resources. | 2 | L1, L2,L3 |
| **Total Hrs.** | | **15** | |

**Books and References:**

| S.No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1. | Cultural Heritage of India-course material | V. Sivaramakrishnan | BharatiyaVidyaBhavan, | 5th Edition, | 2014 |
| 2. | Glimpses of Traditional Indian Life | Bhakti Vikas Swami | Bhakti Vikas Trust | 2014 | 2010 |
| 3. | Knowledge traditions and practices of India, | - | CBSE Publication | 2nd Edition | 2013 |
| 4. | Value Education for Young Leaders | Dr. P Hari Krishna | Vashnavi Krishna Publication | 2nd Edition | 2015 |
| 5. | Open eye Meditation | Shubha Vilas Das | FinGer Print Belief | 2nd Edition | 2016 |
| 6. | Life Amazing Secrets | Gaur Gopal Das | Penguin India | 1st Edition | 2018 |
| 7. | Ethics from Epics | Govinda Das | Tulsi Publication | 1st Edition | 2015 |
| 8. | A Hand Book on PANCH KOSH | Rajesh A Kadam | Shishmahal Arts Co | 1st Edition | 2019 |

**Online References:**

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | Glimpses of Eternal India | https://www.amrita.edu/course/glimpses- eternal-india | M1- M6 |

**T.E. Semester –VI**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="5">B.E.( Computer Engineering)</td><td colspan="3">SEM: VI</td></tr>
<tr><td colspan="5">Course Name: Summer Internship</td><td colspan="3">Course Code: SI-CS601</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="3">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="3">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Total Hours : Maximum 2 Weeks ( 60 to 80 Hours during summer vacation)</td><td></td><td>TW</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>-</td><td>-</td><td rowspan="2">50</td><td rowspan="2">50</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>160*-240*</td><td>4*-6*</td><td></td><td></td></tr>
<tr><td colspan="8">Note :<br>3. Internship will be done in institute laboratory in collaboration with industries.<br>4. Evaluation and assessment will be done as per AICTE guidelines.</td></tr>
<tr><td colspan="8">Prerequisite: Fundamental knowledge of respective programmes</td></tr>
</table>

## Course Objectives:

To get industry like exposure in the institute laboratories by carrying out activities / projects. Also design innovative techniques / methods to develop the products.

## Course Outcomes: Upon completion of the course students will be able to:

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Apply subjects knowledge in the college laboratories for carrying out projects | L3, L4,L5 |
| 2 | Developed innovative techniques / methods to develop the products | L3, L4,L5 |
| 3 | Contribute for the society | L3, L4,L5 |

**Detailed Syllabus:**

| Module No. | Topics | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | **Program Specific Internship**<br>• Training and certification on emerging technologies in domains offered by Department of Computer Engineering<br>• Applying classroom and laboratory knowledge to design , develop and deploy the products | L3, L4,L5 |
| 2 | **Inter disciplinary Internship**<br>• To explore and understand issues and challenges in the other disciplines (EXTC, ELEX, MECH and CIVIL)<br>• Design , develop and deploy cost effective products using multidisciplinary approach | L3, L4,L5 |
| 3 | **Industry Specific Internship**<br>• To explore and understand issues and challenges in industry<br>• Developing solutions for industry specific problems<br>• Design , develop and deploy products for startup and SMEs | L3, L4,L5 |
| 4 | **Interpersonal Internship**<br>• To develop interpersonal skills such as leadership, marketing ,publicity and corporate ethics and communication<br>• To get competence in problem solving , presentation , negotiation skills | L3, L4,L5 |
| 5 | **Social Internship**<br>• Identify and study different real life issues in the society<br>• Identify societal problems and provide engineering solutions to solve these problems | L3, L4,L5 |
| 6 | **Academic Internship**<br>• Study report preparation, preparation of presentations, copy table book preparation , business proposal and IPR<br>• Capture aspirations & expectations through interviews of students.<br>• Ways to connect research in technical institutes with industry.<br>• Taking inputs from self, local stakeholders and global stake holders which will help to develop process with comparative and competitive study | L3, L4,L5 |

**Books and References:**

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | The Ultimate Guide to Internships: 100 Steps to Get a Great Internship and Thrive in It (Ultimate Guides) | Eric Woodard | Allworth | I | 2015 |

**Online References:**

| **Sr. No.** | **Website Name** | **URL** | **Modules Covered** |
|---|---|---|---|
| **1** | https://www.letsintern.com/ | https://www.letsintern.com/internships/summer-internships | M1-M6 |
| 1 | https://codegnan.com | https:/codegnan.com/blog/benefits-of-internships-and-importance | M1-M6 |
| 2 | https://www.honorsociety.org | https://www.honorsociety.org/articles?category=internships | M1-M6 |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**
**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="5">B.E.(Computer)</td><td colspan="4">T.E. SEM: VI</td></tr>
<tr><td colspan="5">Course Name: : Professional Skill VI (Android App Development)</td><td colspan="4">Course Code: HSD - CSPS601</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Conducted in the beginning of Semester during first 3 Weeks</td><td>Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>(AC) Presentation</td><td>(AC) Report</td><td rowspan="2">75</td></tr>
<tr><td>1 5</td><td>-</td><td>30</td><td>45</td><td>2</td><td>-</td><td>-</td><td>50</td><td>25</td></tr>
<tr><td colspan="9">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>AC: Activity<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="9">Prerequisite: Java Programming Basics.</td></tr>
</table>

**Course Objective:** The course intends to deliver the fundamental knowledge of Android platform and its architecture to apply and create Android UI designing.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand Android platform, Architecture and features | L1, L2 |
| 2 | Design User Interface and develop activity for Android App. Development | L1, L2, L3 |
| 3 | Use Intent, Broadcast receivers and Internet services in Android App. Development | L1, L2, L3 |
| 4 | Design and implement Database Application and Content providers. | L1, L2, L3 |
| 5 | Apply multimedia, camera and Location based services in Android App. Development | L1, L2, L3 |
| 6 | Understand various security issues in Android platform. | L1, L2, |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Android**<br>Android overview, Features of Android, Android Applications. Setting up Java Development Kit (JDK), Setting up Android SDK, Setting up Eclipse IDE, Setting up Android Development Tools (ADT) Plugin, Creating Android Virtual Device. | 2 | L1, L2, L3 |
| 2 | **Android Architecture and Design Components**<br>Application: Application Manifest File, Externalizing Resources, Android Application Lifecycle and Android Application Class. Android Activity: Creating activities, Activity lifecycle and Android Activity classes. User Interface: Fundamental Android UI Design, Layouts, Fragments, Designing UI with views, Creating new views, widget toolbox, Adapters. | 3 | L1, L2, L3 |
| 3 | **Intents, Broad Cast receiver and Internet Resources**<br>Introducing Intents, Linking Activities Using intents, Calling Built-in Applications Using intents, Displaying notifications, Creating Intent Filters and Broadcast Receivers, Downloading and Parsing Internet Resources, Using the Download Manager, Internet Services, Connecting to Google App Engine | 2 | L1, L2, L3 |
| 4 | **Database Connectivity & Content Providers**<br>Introducing Android Databases, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases, Parsing an XML document, Parsing JSON data. Creating Content Providers, Using Content Providers. | 2 | L1, L2, L3 |
| 5 | **Advance Android Programming**<br>Playing Audio and Video, Manipulating Raw Audio, Using Audio , Using the Camera for Taking Pictures, Recording Video, Using Media Effects, Adding Media to the Media Store. Using Location-Based Services, Using the Emulator with Location-Based Services, Selecting a Location Provider, Finding Your Current Location. | 3 | L1, L2, L3 |
| 6 | **Android Application Deployment**<br>Android Security Model, Android's Manifest Permissions, Mobile Security Issues, Recent Android Attacks, Pen Testing Android. Preparing for Publishing, Deploying APK Files T | 3 | L1, L2, L3 |
| **Total Hours** | | **15** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Professional Android 4 Application Development | RETO MEIER | Wrox publication | 3 rd | 2012 |
| 2 | Beginning Android Application Development | Abhishek Dubey, Anmol Misra | CRC Press | 1 st | 2013 |
| 3 | Android Application Development For Dummies Android Cookbook | Ian F. Darwin | O'Reilly | 1 st | 2011 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | https://developer.android.com<br>https://www.tutorialspoint.com/ | https://developer.android.com/training/basics/firstapp<br>https://www.tutorialspoint.com/android/android_application_components | M1, M2 |
| 2 | https://www.udemy.com/<br>https://www.coursera.org/<br>https://www.tutorialspoint.com/ | https://www.udemy.com/learn-android-application-development-y/<br>https://www.coursera.org/specializations/android-app-development<br>https://www.tutorialspoint.com/android/android_intents_filters.htm | M3. M4, M5, M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Install/configurejava development kit(Jdk), android studio, android sdk and AVD | 2 | L1,L2 |
| 2 | | Write a program to display hello world on screen. | 2 | L1,L2 |
| 3 | **Design Experiments** | Write program to implement frame layout, table layout and relative layout. | 2 | L1,L2, L3 |
| 4 | | Write program to implement login window using UI controls. | 2 | L1, L2, L3 |
| 5 | | Write a program to implement date and time picker. | 2 | L1,L2, L3 |
| 6 | | Write a program to implement new activity using explicit intent and implicit intent. | 2 | L1, L2, L3 |
| 7 | | Write a program to implement content provider. | 2 | L1, L2, L3 |
| 8 | | Write a program to implement database connectivity using SQLite. | 2 | L1,L2 |
| 9 | | Write a program to XML document in android. | 2 | L1, L2, L3 |
| 10 | | Write a program to design camera. | 2 | L1,L2 |
| 11 | | Write a program to implement to location service. | 2 | L1, L2, L3 |
| 12 | | Design and deploy application. | 2 | L1,L2, L3 |
| 13 | **Case Study** | 1. Configuring Android in Linux | 2 | L1, L2, L3 |
| 14 | **Mini Project** | 1. Android Bluetooth-based Chatting App<br>2. Smart Travel Guide Application<br>3. Mobile Banking App | 4 | L1, L2, L3 |
| | | **Total Hours** | **30** | |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

<table>
<tr><td colspan="5">B.E (Computer Engineering)</td><td colspan="3">T. E SEM: VI</td></tr>
<tr><td colspan="5">Course Name: : Project based Learning-IV</td><td colspan="3">Course Code: HSD - CSPBL601</td></tr>
<tr><td colspan="5">Teaching Scheme (Holistic Student Development - HSD) Industry Specific/Interdisciplinary</td><td colspan="3">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="3">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Conducted in the beginning of Semester during first 3 Weeks</td><td>Presentation (25)</td><td>Report (25)</td><td>Term Work (25)</td></tr>
<tr><td rowspan="2">(AC)</td><td rowspan="2">(AC)</td><td rowspan="2">25</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td></tr>
<tr><td>-</td><td>-</td><td>30</td><td>30</td><td>1</td><td>25</td><td>-</td></tr>
<tr><td colspan="8">IA: In-Semester Assessment - Paper Duration – 1.5 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>AC: Activity<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="8">Prerequisite: Web Development</td></tr>
</table>

**Course Objective:** The Course intends to aid students identify real world problems and apply android programming skills to find solutions to them.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Interpret the basic real time problems. | L1, L2 |
| 2 | Apply android programming skills to solve real time problems. | L1, L2, L3 |
| 3 | Interpret the results obtained for documentation and presentation. | L1-L6 |

## Projects Listing:

| Sr. No | Project Topic | Types of project |
|---|---|---|
| 1 | Smart Travel Guide Application | Application |
| 2 | Android Bluetooth-based Chatting App | Application |
| 3 | Surveillance Camera | Core |
| 4 | Android Bluetooth-based Chatting App | Application |
| 5 | Remote Password Security | Research |
| 6 | Android Voice Based Train Time-Table | Application |
| 7 | Android Vehicle Toll Payment System | Application |
| 8 | Android Based Self Attendance System Using OTP | Application |
| 9 | Automated Canteen Ordering System using Android | Application |
| 10 | Medical Search Engine Project | Application |

**T.E. Semester –VI**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

**Syllabus under Autonomy Scheme**

| **BE (Computer Engineering)** | | | | | **SEM: VI** | | |
|---|---|---|---|---|---|---|---|
| **Course Name:** Research Based Learning II | | | | | **Course Code:** HSD - CSRBL601 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Assessment/Evaluation Scheme** | | |
| **Conducted in the beginning of Semester during first 3 Weeks** | | | | | **Presentation** | **Report** | **Term Work** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **AC** | **AC** | **TW** |
| - | - | 30 | 30 | 1 | 25 | 25 | 50 |
| Audit course evaluated by Teacher Guardian | | | | | | | |
| Mid Semester Assessment for Term work will be on continuous basis | | | | | | | |
| **Prerequisite:** Subject knowledge, Domain knowledge | | | | | | | |

**Course Objectives :**This course is focused to engage the learner in research using critical thinking, problem solving, coding and technical writing related to upcoming latest technologies.

**Course Outcomes :Upon completion of the course students will be able to:**

| S.N. | Course Outcome | Cognitive level attainment as per revised Bloom Taxonomy |
|---|---|---|
| 1 | Upgrade the knowledge of latest technologies and developments in their domain. | L1, L2 |
| 2 | Develop prototype based on idea which providing solutions to industry, research organization, academic organization, community or society as a whole. | L1, L2, L3,L4,l5,L6 |
| 3 | Design and develop the code /model for given problem definition in a competitive environment and contribute for grants. | L1, L2, L3,L4,l5,L6 |
| 4 | Write a research paper and understand technical writing. | L1, L2, L3,L4,l5 |

**Detailed Syllabus:**

| Module No. | Topics | Cognitive level attainment as per revised Bloom Taxonomy |
|---|---|---|
| 1 | **Participation in online community / Forums/writing Blogs**<br>I. **Registration** on online community/forum/follow blogs /Twitter etc. Creating own Blogs and Linked in profile.<br><br>II. **Evaluation** is based on report submission on activities learned through registration on various platforms. Student need to submit Linkedin profile address, Blog URL is recommended<br><br>**Presentation and Evaluation** | L1, L2 |
| 2 | **Proto type development/ Mathematical model development based on Idea**<br>I. **Proto type development**: Introduction to Research Methodology techniques. Introduction and importance of prototype development. Transforming Idea into prototype with implementation/working model. | L1, L2, L3,L4,l5,L6 |

| | | |
|---|---|---|
| | II. **Presentations** by students, Experience sharing by entrepreneurs or Hackathon Winners.<br><br>**Presentation and Evaluation** | |
| 3 | **Building Competitive Attitude**<br>I. **Participation in Project competitions/Coding competitions/Working for research grant/Consultancy: a)** Participating at institute/National level/University level/ Conference /participate in competitions. **b)** Participation in funded project/consultancy projects **c)** Experience sharing by good coders/winners<br><br>II. **Evaluation** based on Presentation/Certificates/ Grant received/Consultancy received<br><br>**Presentation and Evaluation** | L1, L2, L3,L4,l5,L6 |
| 4 | **Research Paper Publication**<br>I. **Introduction to Research paper writing:** Write a paper/case study on review of literature based on idea and developed prototype.<br>II. **Publishing:** Identification of appropriate journal or conference at University level / State level/National level for submission and Preparation of a review paper.<br>**Evaluation of Research paper based on quality and acceptance of research paper.** | L1, L2, L3,L4,L5,L6 |

## References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 2. | Guide to Competitive Programming: Learning and Improving Algorithms Through Contests | Antti Laaksonen | Springer | Kindle | 2018 |
| 3. | Writing Research Papers: A Complete Guide | James D. Lester | Longman | 10th | 2001 |
| 3. | Creativity in Product Innovation | Jacob Goldenberg | Cambridge University Press | Kindle | 2002 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 6. | https://www.researchgate.net | https://www.researchgate.net/publication/224372998_Idea_Generation_Techniques_among_Creative_Professionals | M2 |
| 7. | https://discuss.codechef.com | https://discuss.codechef.com/t/programming-contest-detailed-syllabus-along-with-example-problems/17791 | M3 |
| 8. | https://www.statpac.com | https://www.statpac.com/online-software-manual/Basic-Research-Concepts.htm | M4 |
| 9. | https://www.slideshare.net | https://www.slideshare.net/AsirJohnSamuel/1introduction-to-research-methodology?next_slideshow=1 | M4 |

**B.E. Semester –VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VII</td></tr>
<tr><td colspan="7">Course Name : Digital Signal & Image Processing</td><td colspan="4">Course Code :CSC701</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">125</td></tr>
<tr><td>4</td><td>-</td><td>2</td><td>6</td><td>5</td><td>20</td><td>80</td><td>-</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Engineering Mathematics, Basic Knowledge of Signals and System</td></tr>
</table>

**Course Objective:** The course intends to deliver the concepts of digital signal processing and Image processing and apply this knowledge on different image processing aspects.

**Course Outcomes :Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Apply the concept of DT Signal and DT Systems. | L1, L2, L3 |
| 2 | Classify and analyze discrete time signals and systems. | L1, L2, L3, L4 |
| 3 | Experiment with Digital Signal Transform techniques DFT and FFT. | L1, L2, L3,L4 |
| 4 | Make use of enhancement techniques for digital Image Processing. | L1, L2 |
| 5 | Explain advantages and disadvantages of different edge detection techniques. | L1, L2, L3 |
| 6 | Develop small projects of 1-D and 2-D Digital Signal Processing. | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Discrete-Time Signal and Discrete-Time System** | 12 | L1, L2, L3 |
| | Introduction to Digital Signal Processing, Sampling and Reconstruction, Standard DT Signals, Concept of Digital Frequency, Representation of DT signal using Standard DT Signals, Signal Manipulations (shifting, reversal, scaling, addition, multiplication).<br>Classification of Discrete-Time Signals, Classification of Discrete-Systems<br>Linear Convolution formulation for 1-D and 2-D signal (without mathematical proof), Circular Convolution (without mathematical proof), Linear convolution using Circular Convolution. Auto and Cross Correlation formula evaluation, LTI system, Concept of Impulse Response and Step Response, Output of DT system using Time Domain Linear Convolution. | | |
| 2 | **Discrete Fourier Transform** | 6 | L1, L2, L3, L4 |
| | Introduction to DTFT, DFT, Relation between DFT and DTFT, IDFT<br>Properties of DFT without mathematical proof (Scaling and Linearity, Periodicity, Time Shift and Frequency Shift, Time Reversal, Convolution Property and Parsevals' Energy Theorem). DFT computation using DFT properties.<br>Transfer function of DT System in frequency domain using DFT.<br>Linear and Circular Convolution using DFT, Convolution of long sequences, Introduction to 2-D DFT | | |
| 3 | **Fast Fourier Transform** | 6 | L1, L2, L3, L4 |
| | Need of FFT, Radix-2 DIT-FFT algorithm,<br>FFT Flow graph for N=4 and 8, Inverse FFT algorithm.<br>Spectral Analysis using FFT | | |
| 4 | **Digital Image Fundamentals** | 8 | L1, L2 |
| | Introduction to Digital Image, Digital Image Processing System, Sampling and Quantization<br>Representation of Digital Image, Connectivity<br>Image File Formats: BMP, TIFF and JPEG. | | |
| 5 | **Image Enhancement in Spatial domain** | 12 | L1, L2, L3 |
| | Gray Level Transformations, Zero Memory Point Operations, Histogram Processing, Histogram equalization.<br>Neighborhood Processing, Spatial Filtering, Smoothing and Sharpening Filters, Median Filter | | |
| 6 | **Image Segmentation** | 8 | L1, L2, L3 |
| | Segmentation based on Discontinuities (point, Line, Edge),<br>Image Edge detection using Robert, Sobel, Previtt masks, Image Edge detection using Laplacian Mask | | |
| | **Total Hours** | **52** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Digital Signal Processing: Principles, Algorithms, and Applications | John G. Proakis, Dimitris and G.Manolakis | Pearson Education | Fourth Edition | 2007 |
| 2 | Digital Signal Processing | A. Anand Kumar | PHI Learning Pvt. Ltd. | Second Edition | 2013 |
| 3 | Digital Image Processing | Rafel C. Gonzalez and Richard E. Woods | Pearson Education | ThirdEdition | 2009 |
| 4 | Digital Image Processing | S. Sridhar | Oxford University Press | Second Edition | 2012 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.tutorialspoint.com | https://www.tutorialspoint.com/digital_signal_processing/ | M1,M2,M3 |
| 2 | www.gnits.ac.in | https://www.gnits.ac.in/sites/default/files/ONLINERESOURCES/ECE/dsp.pdf https://lecturenotes.in/subject/44/digital-signal-processing-dsp | M1,M2,M3 |
| 3 | https://lecturenotes.in | https://lecturenotes.in/subject/89/digital-image-processing-dip | M4,M5,M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Illustrate a program to sample a continuous time signal and convert it to Discrete Time Signal. | 2 | L1, L2, L3 |
| 2 | **Design Experiments** | Develop a function to find auto-correlation operation. | 2 | L1, L2, L3 |
| 3 | | Develop a function to find cross-correlation operation. | 2 | L1, L2, L3 |
| 4 | | Experiment with Discrete Fourier transform | 2 | L1, L2, L3 |
| 5 | | Develop a program to perform Fast Fourier Transform of N point signal. | 2 | L1, L2, L3 |
| 6 | | Make use of Image negative, Gray level Slicing and Thresholding on to a given image | 2 | L1, L2, L3 |

| | | | | |
|---|---|---|---|---|
| 7 | | Make use of Contrast Stretching, Dynamic range compression & Bit plane Slicing to a given image | 2 | L1, L2, L3 |
| 8 | | Make use of Histogram Processing | 2 | L1, L2, L3 |
| 9 | | Make use of Image smoothing/ Image sharpening to a given image | 2 | L1, L2, L3 |
| 10 | | Implementation of Edge detection using Sobel and Previtt masks | 2 | L1, L2, L3 |
| 11 | **Mini/Minor Projects/ Seminar/ Case Studies** | **Case Study:**<br>1. Speech signal Processing<br>2. Biomedical Digital Signal Processing<br>3. Image Security<br>4. Study on image cryptographic algorithms. | 4 | L1, L2, L3,L4 |
| 13 | | **Research Paper Presentation**<br>1. Presentation on latest topics from technical papers in Survey of Signal Processing Algorithm and Image Processing. | 2 | L1, L2, L3,L4 |
| 13 | | **Mini Project:**<br>1. Optical character recognition<br>2. Text Recognition in Images<br>3. Face recognition<br>4. Fingerprint recognition<br>5. Handwriting recognition | 4 | L1, L2, L3, L4, L5, L6 |
| | **Total Hours** | | **30** | |

## B.E. Semester –VII

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VII</td></tr>
<tr><td colspan="7">Course Name :Mobile Communication & Computing</td><td colspan="4">Course Code :CSC702</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>4</td><td>-</td><td>2</td><td>6</td><td>5</td><td>20</td><td>80</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hour<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%).</td></tr>
<tr><td colspan="10">Prerequisite: Computer Networks</td></tr>
</table>

**Course Objective:** The course intends to impart fundamental concepts related to mobile communication and computing as well as provide a perspective on the converging area of wireless networking, mobility management and introduce recent research topics.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Illustrate basic concepts and principles in mobile communication & Computing, cellular architecture. | L1, L2 |
| 2 | Demonstrate the components and functioning of mobile networking. | L1, L2, L3, L4 |
| 3 | Classify variety of security techniques in mobile network. | L1, L2, L3, L4 |
| 4 | Apply the concepts of WLAN for local as well as remote applications. | L1, L2, L3 |
| 5 | Apply the concepts of mobility management | L1, L2, L3 |
| 6 | Demonstrate Long Term Evolution (LTE) architecture and its Interfaces. | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Mobile Computing** | 06 | L1, L2 |
| | Introduction to Mobile Computing, Telecommunication Generations, Cellular systems, Electromagnetic Spectrum, Antenna, Signal Propagation, Signal Characteristics, Multiplexing, Spread Spectrum: DSSS& FHSS | | |
| 2 | **GSM Mobile services** | 08 | L1, L2, L3, L4 |
| | GSM Mobile services, System Architecture, Radio interface, Protocols , Localization and Calling, Handover, security**(A3,A5 & A8),** GPRS system and protocol architecture UTRAN , UMTS core network ; Improvements on Core Network | | |
| 3 | **Mobile Networking** | 10 | L1, L2, L3, L4 |
| | **Mobile Networking:** Medium Access Protocol, Internet Protocol and Transport layer,<br>**Medium Access Control:** Motivation for specialized MAC, Introduction to multiple Access techniques (MACA)<br>**Mobile IP**: IP Packet Delivery, Agent Advertisement and Discovery, Registration, Tunneling and Encapsulation, Reverse Tunneling, Routing (DSDV,DSR)<br>**Mobile TCP :**<br>Traditional TCP, Classical TCP Improvements like Indirect TCP, Snooping TCP & Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/Timeout Freezing, Selective Retransmission | | |
| 4 | **Wireless Local Area Networks** | 10 | L1, L2, L3 |
| | **Wireless Local Area Networks :** Introduction, Infrastructure and Ad- Hoc network<br>**IEEE 802.11:**System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, 802.11a, 802.11b<br>**Wi-Fi security :** WEP ,WPA, Wireless LAN Threats, Securing Wireless Networks, Hiper LAN 1 & Hiper LAN 2<br>**Bluetooth:** Introduction, User Scenario, Architecture, protocol stack | | |
| 5 | **Mobility Management** | 7 | L1, L2, L3 |
| | **Mobility Management :** Introduction, IP Mobility, Optimization, IPv6<br>**Macro Mobility** : MIPv6, FMIPv6,<br>**Micro Mobility:** Cellular IP, HAWAII, HMIPv6 | | |
| 6 | **Long-Term Evolution (LTE) of 3GPP** | 11 | L1, L2 |
| | **Long-Term Evolution (LTE) of 3GPP :** LTE System Overview, Evolution from UMTS to LTE<br>LTE/SAE Requirements, SAE Architecture<br>EPS: Evolved Packet System, E-UTRAN, Voice over LTE (VoLTE), Introduction to LTE-Advanced System Aspects, LTE Higher Protocol Layers, LTE MAC layer, LTE PHY Layer,<br>Self-Organizing Network (SON-LTE),SON for Heterogeneous Networks (Het Net), Introduction to 5G | | |
| | **Total Hours** | **52** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Mobile Communication | Jochen Schillller | Pearson Education | Second Edition | 2017 |
| 2 | Wireless Communications & Networks | William Stallings | Pearson education | Second Edition | 2009 |
| 3 | Mobile Computing | Raj Kamal | Oxford University Press-New Delhi | Third Edition | 2018 |
| 4 | LTE Self-Organizing Networks (SON): Network Management Automation for Operational Efficiency | Seppo Hamalainen, Henning Sanneck, Cinzia Sartori, | Wiley publications | First Edition | 2011 |
| 5 | An Introduction to LTE: LTE, LTE-Advanced, SAE and 4G Mobile Communications | Christopher Cox | Wiley publications | Second Edition | 2014 |
| 6 | Mobility Protocols and Handover Optimization: Design, Evaluation and Application | Ashutosh Dutta, Henning Schulzrinne | IEEE Press, Wiley Publication | First Edition | 2015 |
| 7 | Build your own security lab | Michael Gregg | Wiley India edition | First Edition | 2012 |
| 8 | Emerging Wireless Technologies and the Future Mobile Internet | Dipankar Raychaudhuri, Mario Gerla | Cambridge | First Edition | 2011 |
| 9 | Wireless Communications | Andreas F.Molisch | Wiley Publication | Second Edition | 2010 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.coursera.org/ | https://www.coursera.org/learn/wireless-communications | M4 |
| 2 | nptel.ac.in | https://nptel.ac.in/courses/106106147/ | M1-M6 |
| 3 | vlab.amrita.edu | http://vlab.amrita.edu/index.php?sub=78&brch=256 | M1, M3, M5 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Outline cellular architecture with emphasis on the process of clustering and frequency reuse. | 2 | L1, L2, L3 |

| | | | | |
|---|---|---|---|---|
| 2 | | Compare the GSM security algorithms i.e. A3, A5, A8 | 2 | L1, L2, L3 |
| 3 | **Design Experiments** | Apply a Bluetooth network to transfer a file from one device to another. | 2 | L1, L2, L3 |
| 4 | | Apply basic function of Code Division Multiple Access (CDMA) to test the Orthogonality of a code to be used for CDMA operation. | 2 | L1, L2, L3 |
| 5 | | Apply basic function of Code Division Multiple Access (CDMA) to test the autocorrelation of a code to be used for CDMA operation. | 2 | L1, L2, L3 |
| 6 | | Apply setup & configuration of Wireless Access Point (AP) using NS3. | 2 | L1, L2, L3 |
| 7 | | Develop an application that writes data to the SD card. | 2 | L1, L2, L3 |
| 8 | | Develop an application that uses GUI components. | 2 | L1, L2, L3 |
| 9 | | Develop an application that draws basic graphical primitives on the screen. | 2 | L1, L2, L3 |
| 10 | | Develop an application that makes use of database. | 2 | L1, L2, L3 |
| 11 | | Develop an application that creates an alert upon receiving a message. | 2 | L1, L2, L3 |
| 12 | | Develop mobile node discovery | 2 | L1, L2, L3 |
| 13 | **Mini/Minor Projects/ Seminar/ Case Studies** | **Case Study**<br>1. Describe Long Term Evolution (LTE) architecture and its interfaces.<br>2. Describe and compare HiperLAN 1 &HiperLAN 2<br>3. Describe and compare Macro Mobility and Micro Mobility<br>**Mini Project:** Compare number of packet retransmissions required in both RTS/CTS wireless networks | 6 | L1, L2, L3, L4, L5 |
| | | **Total Hours** | **30** | |

**B.E. Semester –VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VII</td></tr>
<tr><td colspan="7">Course Name :Artificial Intelligence & Soft Computing</td><td colspan="4">CSC703</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>4</td><td>-</td><td>2</td><td>6</td><td>5</td><td>20</td><td>80</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hour<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Discrete Mathematics, Analysis of Algorithms, Data Structure</td></tr>
</table>

**Course Objective:** The course intends to deliver the basic knowledge and techniques of AI and SC and apply various AI and SC algorithms to create AI based real world applications/systems.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Evaluate the various characteristics of Artificial Intelligence and Soft Computing techniques. | L1, L2, L3, L4, L5 |
| 2 | Evaluate problem solving methods for an agent to find a sequence of actions to reach the goal state. | L1, L2, L3, L4, L5 |
| 3 | Review the strength and weakness of AI approaches to knowledge representation, reasoning and planning. | L1, L2, L3 |
| 4 | Design fuzzy controller system for real world application. | L1, L2, L3, L4, L5, L6 |
| 5 | Apply supervised and unsupervised ANN for real world applications. | L1, L2, L3 |
| 6 | Apply Hybrid approach for expert system design. | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels as per blooms Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Artificial Intelligence(AI) and Soft Computing** | 4 | L1, L2, L3, L4, L5 |
| | Introduction and Definition of Artificial Intelligence.<br>Intelligent Agents: Agents and Environments, Rationality, Nature of Environment, Structure of Agent, types of Agent.<br>Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques. | | |
| 2 | **Problem Solving** | 10 | L1, L2, L3, L4, L5 |
| | Problem Solving Agent, Formulating Problems, Example Problems<br>Uninformed Search Methods: Depth Limited Search, Depth First Iterative Deepening (DFID), Informed Search Method: A* Search<br>Optimization Problems: Hill climbing Search, Simulated annealing, Genetic algorithm | | |
| 3 | **Knowledge, Reasoning and Planning** | 10 | L1, L2, L3 |
| | Knowledge based agents First order logic: syntax and Semantic, Knowledge Engineering in FOL, Inference in FOL : Unification, Forward Chaining, Backward Chaining and Resolution<br>Planning Agent, Types of Planning: Partial Order, Hierarchical Order, Conditional Order | | |
| 4 | **Fuzzy Logic** | 12 | L1, L2, L3, L4, L5, L6 |
| | Introduction to Fuzzy Set: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, membership functions<br>Fuzzy Logic: Fuzzy Logic basics, Fuzzy Rules and Fuzzy Reasoning<br>Fuzzy inference systems: Fuzzification of input variables, defuzzification and fuzzy controllers | | |
| 5 | **Artificial Neural Network** | 12 | L1, L2, L3 |
| | Introduction – Fundamental concept– Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron Neural Network Architecture: Perceptron, Single layer Feed Forward ANN, Multilayer Feed Forward ANN, Activation functions, Supervised Learning: Delta learning rule, Back Propagation algorithm. Un-Supervised Learning algorithm: Self Organizing Maps | | |
| 6 | **Expert System** | 4 | L1, L2, L3 |
| | Hybrid Approach - Fuzzy Neural Systems<br>Expert system : Introduction, Characteristics, Architecture, Stages in the development of expert system | | |
| | **Total Hours** | **52** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Artificial Intelligence a Modern Approach | Stuart J. Russell and Peter Norvig | McGraw Hill | Third Edition | 2009 |
| 2 | Introduction to soft computing | Samir Roy and Chakraborty | Pearson Edition | First Edition | 2013 |
| 3 | Principles of Soft Computing | S.N.Sivanandam, S.N.Deepa | Wiley Publication | Second Edition | 2011 |
| 4 | Neural Networks, Fuzzy Logic and Genetic Algorithms | S.Rajasekaran and G.A.VijayalakshmiPai | PHI Learning | Second Edition | 2017 |
| 5 | Artificial Intelligence and Intelligent Systems | N. P. Padhy | Oxford | First Edition | 2005 |
| 6 | Artificial Intelligence | Elaine Rich and Kevin Knight | Tata McGraw-Hill Education Pvt. Ltd. | Third Edition | 2008 |
| 7 | Neural Networks A Classroom Approach | Satish Kumar | Tata McGraw-Hill Education Pvt. Ltd. | Second Edition | 2012 |
| 8 | Fuzzy Set Theory and its Applications | Zimmermann H.S | Kluwer Academic Publishers | Fourth Edition | 2001 |
| 9 | Neural Network Design | Hagan, Demuth, Beale | CENGAGE Learning, India Edition | Second Edition | 2014 |
| 10 | Neuro-Fuzzy and Soft Computing | J.-S.R.Jang | PHI | Third Edition | 2003 |
| 11 | Introduction to Artificial Neural Sytems | Jacek M. Zurada | Jaico Publishing House | First Edition | 1994 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | https://nptel.ac.in | https://nptel.ac.in/courses/106105077/ | M1-3 |
| 2 | https://nptel.ac.in | https://nptel.ac.in/courses/106105173/ | M4-6 |

## List of Practical/ Experiments:

| Sr. No. | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels as per blooms Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiment** | (a) Specify problem formulation for an AI problem.<br>(b) Specify PEAS description for an AI agent. | 2 | L1, L2, L3, L4, L5 |
| 2 | | Solve a given problem using uninformed search technique. | 2 | L1, L2, L3, L4, L5 |
| 3 | **Design Experiments** | Solve a given problem using informed search technique. | 2 | L1, L2, L3, L4, L5 |
| 4 | | Develop solution to optimization problem using Genetic Algorithm. | 2 | L1, L2, L3, L4, L5 |
| 5 | | Build knowledge base for Wumpus world problem. | 2 | L1, L2, L3 |
| 6 | | Solve a reasoning problem using unification. | 2 | L1, L2, L3 |
| 7 | | Apply concepts of Fuzzy to develop a Fuzzy Controller system. | 2 | L1, L2, L3 |
| 8 | | Apply Mc-Culloch Pitts Model to solve a classification problem. | 2 | L1, L2, L3 |
| 9 | **Advanced Experiments** | Solve given problem using Supervised Neural Network. | 2 | L1, L2, L3 |
| 10 | | Solve given problem using unsupervised Neural Network. | 2 | L1, L2, L3 |
| 11 | **Case Studies** | Investigate a Case study on Hybrid Systems | 2 | L1, L2, L3, L4 |
| 12 | | Investigate a Case study of a real life /Industry based Application | 2 | L1, L2, L3, L4 |
| 13 | **Mini Projects** | 1. Game Development<br>2. Chabot<br>3. Pattern Recognition<br>4. Prediction<br>5. Smart Apps<br>6. Fuzzy System | 6 | L1, L2, L3, L4, L5, L6 |
| | | **Total Hours** | **30** | |

**B.E. Semester–VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :**Department Level Optional Course – III (Advanced System Security and Digital Forensics) | | | | | | | **Course Code :**CSDLO7031 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 4 | - | 2 | 6 | 5 | 20 | 80 | 25 | 25 | **150** |
| **IA: In-Semester Assessment - Paper Duration – 1 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%). | | | | | | | | | |
| **Prerequisite:** System Security | | | | | | | | | |

**Course Objective :** The course intends to deliver advanced concepts about System Security to develop security management and policies for reducing Cyber-Attacks. It will also help in understanding and explore techniques used in Digital Forensics and analyze various software vulnerabilities, attacks and protection in Web Applications& Wi-Fi Networks

**Course Outcomes :Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Apply access control policies and control mechanisms to cyber-attacks | L1, L2, L3 |
| 2 | Identify malicious code and targeted malicious code | L1, L2, L3 |
| 3 | Analyze threats to web applications | L1, L2, L3, L4 |
| 4 | Understand the vulnerabilities of Wi-Fi networks and explore different measures to secure wireless protocols, WLAN and VPN network | L1, L2, L3, L4 |
| 5 | Asses ethical and legal issues associated with cyber-crimes and be able to mitigate impact of crimes with suitable policies | L1, L2, L3, L4, L5 |
| 6 | Make use of different forensic tools to acquire and duplicate data from compromised systems and analyze the same | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels as per blooms Taxonomy |
|---|---|---|---|
| 1 | **Introduction & Access Control** | 7 | L1, L2, L3 |
| | Cyber-attacks, Vulnerabilities, Defense Strategies and Techniques, Authentication Methods and Protocols, Defense in Depth Strategies<br>Access Control Policies: DAC, MAC, Multi-level Security Models: Biba Model, Bell La Padula Model, Single Sign on, Federated Identity Management | | |
| 2 | **Program & OS Security** | 7 | L1, L2, L3 |
| | Malicious and Non-Malicious programming errors, Targeted Malicious codes: Salami Attack, Linearization Attack, Covert Channel, Control against Program threats, Operating System Security: Memory and Address protection, File Protection Mechanism, User Authentication<br>Linux and Windows: Vulnerabilities, File System Security | | |
| 3 | **Web Application Security** | 10 | L1, L2, L3, L4 |
| | OWASP, Web Security Considerations, User Authentication and Session Management, Cookies, SSL, HTTPS, SSH, Privacy on Web, Web Browser Attacks, Account Harvesting, Web Bugs, Clickjacking, Cross-Site Request Forgery, Session Hijacking and Management, Phishing and Pharming Techniques, Web Service Security, OAuth 2.0 | | |
| 4 | **Wireless Security** | 9 | L1, L2, L3, L4 |
| | Wi-Fi Security, WEP, WPA, WPA-2, Mobile Device Security- Security Threats, Device Security, GSM and UMTS Security, IEEE 802.11/802.11i Wireless LAN Security, VPN Security | | |
| 5 | **Legal and Ethical issues** | 7 | L1, L2, L3, L4, L5 |
| | Cybercrime and its types, Intellectual property, Privacy, Ethical issues<br>Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, case studies of ethics | | |
| 6 | **Digital Forensics** | 12 | L1, L2, L3, L4 |
| | Introduction to Digital Forensics, Acquiring Volatile Data from Windows and Unix systems, Forensic Duplication Techniques, Analysis of forensic images using open source tools like Autopsy and SIFT, Investigating logs from Unix and windows systems, Investigating Windows Registry | | |
| | **Total Hours** | **52** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1. | Computer Security Principles and Practice | William Stallings | Pearson Education | Sixth Edition | 2011 |
| 2. | Security in Computing | Charles P. fleeger | Pearson Education | Fifth Edition | 2015 |
| 3. | Network Security and Cryptography | Bernard Menezes | Cengage Learning | Second Edition | 2014 |
| 4. | Network Security Bible | Eric Cole | Wiley | Second Edition | 2009 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1. | https://www.owasp.org/index.php/Main_Page | https://www.owasp.org/index.php/Category:OWASP_Top_Ten_Project | M1-M2 |
| 2. | https://www.tutorialspoint.com/index.htm | https://www.tutorialspoint.com/operating_system/os_security | M2-M3 |
| 3. | https://www.tutorialspoint.com/index.htm | https://www.tutorialspoint.com/wireless_security/ | M4 |
| 4. | https://pressbooks.com/ | https://bus206.pressbooks.com/chapter/chapter-12-the-ethical-and-legal-implications-of-information-systems/ | M5 |
| 5. | https://www.open.edu/openlearn/ | https://www.open.edu/openlearn/science-maths-technology/digital-forensics/content-section-4.3 | M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels as per blooms Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Explain vulnerability scanning using Nessus, Nikto (Kali Linux) | 2 | L1, L2 |
| 2 | | Illustrate web-application vulnerabilities using open source tools like Wapiti, browser exploitation framework (BeEf), etc. | 2 | L1, L2 |
| 3 | | Identify SQL injection vulnerabilities in a website database using SQLMap | 2 | L1, L2, L3 |
| 4 | **Design Experiments** | Apply Installation step and use a security app on an Android mobile (e.g. Droidcrypt) | 2 | L1, L2, L3 |
| 5 | | Make use of forensics tools in Kali Linux for acquiring, analyzing and duplicating data: dd, dcfldd, foremost, scalpel, debugfs, wireshark, tcptrace, tcpflow | 2 | L1, L2, L3 |
| 6 | | Analyze forensic images using open source tools like Autopsy, SIFT, FKT Imager | 2 | L1, L2, L3, L4 |
| 7 | | Make use of steganographic tools like OpenStego, to detect data hiding or unauthorized file copying | 2 | L1, L2, L3 |
| 8 | | Make use Password cracking using tools like John the Ripper/Cain and Abel/ Ophcrack to detect weak passwords. | 2 | L1, L2, L3 |
| 9 | | Analyze static code using open source tools like RATS, Flawfinder etc. | 2 | L1, L2, L3, L4 |
| 10 | | Apply a penetration testing using Metasploit (Kali Linux) | 2 | L1, L2, L3 |
| 11 | **Case Studies** | 1. Exploring Authentication and access control using RADIUS, TACACS and TACACS+<br>2. Case Study on Stegonographic Tools<br>3. Case Study on latest Digital Forensic Tools | 4 | L1, L2, L3, L4 |

| | | | | |
|---|---|---|---|---|
| 12 | **Mini/Minor Projects/** | 1. Application Security<br>2. Stenography<br>3. Authentication Mechanisms<br>4. Android Security Application<br>5. Vulnerability Scanner | 6 | L1, L2, L3, L4,L5, L6 |
| | | **Total Hours** | **30** | |

**B.E. Semester –VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VII</td></tr>
<tr><td colspan="7">Course Name :Department Level Optional Course -III<br>(Big Data Analytics)</td><td colspan="4">Course Code :CSDLO7032</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>4</td><td>-</td><td>2</td><td>6</td><td>5</td><td>20</td><td>80</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hour<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Database Management System, Data Warehouse and Mining, Machine Learning</td></tr>
</table>

**Course Objective :**The course intends to provide an overview of an exciting growing field of big data analytics and equip the students with programming skills to solve complex real world problems using big data technologies.

**Course Outcomes :Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Outline the key issues in big data management and its associated applications for business decisions and strategy. | L1, L2 |
| 2 | Develop problem solving and critical thinking skills in fundamental enabling techniques like Hadoop, Map-reduce and NoSQL in big data analytics. | L1, L2, L3 |
| 3 | Collect, manage, store, query and analyze various forms of Big Data. | L1, L2, L3, L4 |
| 4 | Interpret business models and scientific computing paradigms, and apply software tools for big data analytics. | L1, L2, L3, L4, L5 |
| 5 | Appraise adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc... | L1, L2, L3, L4, L5 |
| 6 | Solve Complex real world problems in various applications like recommender systems, social media applications, health and medical systems, etc. | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Big Data and Hadoop** | 6 | L1, L2 |
| | Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach, Case Study of Big Data Solutions.<br>Concept of Hadoop, Core Hadoop Components; Hadoop Ecosystem | | |
| 2 | **Hadoop HDFS and MapReduce** | 10 | L1, L2, L3 |
| | **Distributed File Systems:** Physical Organization of Compute Nodes, Large-Scale File-System Organization**.**<br>**MapReduce:** The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures.<br>**Algorithms Using MapReduce:** Matrix-Vector Multiplication by MapReduce, Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce<br>**Hadoop Limitations**. | | |
| 3 | **NoSQL** | 6 | L1, L2, L3, L4 |
| | Introduction to NoSQL, NoSQL Business Drivers,<br>**NoSQL Data Architecture Patterns**: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Variations of NoSQL architectural patterns, NoSQL Case Study<br>NoSQL solution for big data, Understanding the types of big data problems; Analyzing big data with a shared-nothing architecture; Choosing distribution models: master-slave versus peer-to- to-peer; Four ways that NoSQL systems handle big data problems | | |
| 4 | **Mining Data Streams** | 12 | L1, L2, L3, L4, L5 |
| | **The Stream Data Model**: A Data-Stream-Management System, Examples of Stream Sources, Stream Queries, Issues in Stream Processing, Sampling Data techniques in a Stream, Filtering Streams: Bloom Filter with Analysis, Counting Distinct Elements in a Stream, Count-Distinct Problem, Flajolet-Martin Algorithm, Combining Estimates, Space Requirements,<br>**Counting Frequent Items in a Stream,** Sampling Methods for Streams, frequent Item sets in Decaying Windows, Counting Ones in a Window: The Cost of Exact Counts, The Datar -Gionis-Indyk-Motwani Algorithm, Query Answering in the DGIM Algorithm, Decaying Windows. | | |
| 5 | **Finding Similar Items and Clustering** | 8 | L1, L2, L3, L4, L5 |
| | **Distance Measures:** Definition of a Distance Measure, Euclidean Distances, Jaccard Distance, Cosine Distance, Edit Distance, Hamming Distance .CURE Algorithm, Stream-Computing , A Stream-Clustering Algorithm ,Initializing& Merging Buckets, Answering Queries | | |
| 6 | **Real-Time Big Data Models** | 10 | L1, L2, L3 |
| | **PageRank Overview,** Efficient computation of PageRank: PageRank Iteration Using MapReduce, Use of Combiners to Consolidate the Result Vector<br>**A Model for Recommendation Systems,** Content-Based Recommendations, Collaborative Filtering<br>**Social Networks as Graphs,** Clustering of Social-Network Graphs, Direct Discovery of Communities in a social graph**.** | | |
| | **Total Hours** | **52** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Mining of Massive Datasets | AnandRajaraman and Jeff Ullman | Cambridge University Press | First Edition | 2012 |
| 2 | Hadoop in Practice | Alex Holmes | Manning Press, Dreamtech Press | Second Edition | 2015 |
| 3 | Making Sense of NoSQL- A guide for managers and the rest of us | Dan Mcary and Ann Kelly | Manning Press | First Edition | 2010 |
| 4 | Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics | Bill Franks | John Wiley & Sons | First Edition | 2012 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.mmds.org | http://www.mmds.org | M1-M6 |
| 2 | www.guru99.com | https://www.guru99.com/bigdata-tutorials.html | M1,M2 |
| 3 | www.edureka.co | https://www.edureka.co/blog/hadoop-tutorial/ | M1, M2 |
| 4 | www.tutorailride.com | https://www.tutorialride.com/big-data-analytics | M1-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels as per blooms Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Explain Hadoop Ecosystem | 2 | L1, L2 |
| 2 | | Experiment with basic programs of Hadoop | 2 | L1, L2, L3 |
| 3 | | Make use of Sqoop tool to transfer data between Hadoop and relational database servers. | 2 | L1, L2, L3 |
| 4 | **Design Experiments** | Apply Installation and configuration steps ofMongoDB/Cassandra/HBase to execute NoSQL commands | 2 | L1, L2, L3 |
| 5 | | Apply Map Reduce to Word count problem | 2 | L1, L2, L3 |
| 6 | | Experiment withHadoop Map-Reduce/PySpark | 2 | L1, L2, L3 |

| | | | | |
|---|---|---|---|---|
| 7 | | Develop clustering algorithm K-means/CURE using MapReduce | 2 | L1, L2, L3 |
| 8 | | ApplyMap- Reduce to implement Matrix multiplication, Aggregates, joins, sorting, searching | 2 | L1, L2, L3 |
| 9 | | Develop DGIM algorithm/ Bloom Filter using any programming language | 2 | L1, L2, L3 |
| 10 | | DevelopPageRank algorithm | 2 | L1, L2, L3 |
| 11 | **Advanced Experiments** | DevelopHIVE Database and Descriptive analytics-basic statistics, visualization using HIVE/PIG/R | 2 | L1, L2, L3 |
| 12 | | Apply R/Scilab/rapid miner to implement predictive analytics techniques (regression/time series) | 2 | L1, L2, L3 |
| 13 | **Mini/Minor Projects/ Seminar/ Case Studies** | 1. Twitter data analysis<br>2. fraud detection<br>3. Text Mining<br>4. Opinion mining<br>5. Fraud detection analysis<br>6. Similar topic detection analysis | 4 | L1, L2, L3, L4,L5, L6 |
| 14 | **Paper writing on Different Big data analysis techniques in real life** | Identify research topics in Big data analytics and write a research paper | 2 | L1, L2, L3, L4 |
| | | **Total Hours** | **30** | |

**B.E. Semester –VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :**Department Level Optional Course - III (Robotics) | | | | | | | **Course Code :**CSDLO7033 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 4 | - | 2 | 6 | 5 | 20 | 80 | 25 | 25 | **150** |
| **IA: In-Semester Assessment - Paper Duration – 1 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Engineering Mathematics | | | | | | | | | |

**Course Objective :**The course intends to introduce the principles of robotics, and apply mathematical Kinematic modeling for manipulation of Robot in 3-D Space, It will also use various actuator and sensor to provide vision for proper task planning of the Robot.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Outline typical robot and its characteristics. | L1, L2 |
| 2 | Analyze kinematics parameters of robotic manipulator. | L1, L2, L3, L4 |
| 3 | Identify actuators, sensors and control of a robot for different applications. | L1, L2, L3 |
| 4 | Analyze motion of the robot for task planning | L1, L2, L3, L4 |
| 5 | Apply Robotics to solve day to day problems using vision algorithms. | L1, L2, L3 |
| 6 | Develop an Expert system of Robotics using Fuzzy logic controller | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction and Fundamentals of Robotics**<br>Types of automation, Introduction, definition of a Robot, Classification of Robots, Robotics, History of Robotics, Advantages and Disadvantages of Robots, Robot Applications<br>Tasks involved in Robotics, Robot Components, Robot characteristics and classification, Degrees of Freedom, Robot joints, Robot Coordinates, Robot Reference frames, Programming Modes, Robot Workspace, Work Envelop. | 6 | L1, L2 |
| 2 | **Direct and Inverse Kinematics**<br>**Direct (Forward) Kinematics**: Homogeneous coordinates, Link coordinates, Coordinate frame, coordinate transform, Arm equations, An example – Four Axis SCARA.<br>**Inverse Kinematics:** Inverse kinematics problem, Tool Configuration, An example – Four Axis SCARA. | 12 | L1, L2, L3, L4 |
| 3 | **Sensors, Actuators and Drive Systems**<br>**Sensors:** Characteristics, Utilization, Types - Position, Velocity, Acceleration, Force and Pressure, Torque, Visible Light and Infrared, Touch and Tactile, Proximity, Range Finders sensors.<br>**Actuators and Drive System:** Characteristics, Hydraulic Actuators, Pneumatic Devices, Electric Motors | 4 | L1, L2, L3 |
| 4 | **Robot Task and Motion Planning**<br>**Reactive Paradigms:** Overview, Attributes of reactive paradigm<br>Task level programming, Uncertainty, Configuration Space, Gross motion planning, Fine-motion planning, Simulation of Planner motion, Source and goal scene, Task planner Simulation.<br>**Robot Motion Planning:** Concept of motion planning, BUG 1, BUG 2 and Tangent Bug Algorithms | 11 | L1, L2, L3, L4 |
| 5 | **Robot Vision**<br>Image Representation, Template Matching, Polyhedral Objects<br>Shape Analysis, Iterative Processing<br>Perspective Transformations, Structured Illumination , Camera Calibration | 11 | L1, L2, L3 |
| 6 | **Expert Systems, Robot Language and Fuzzy Logic**<br>Introduction to Expert Systems, Expert system Characteristics, Robot as Expert System, Robot Languages: Classification of Robot Languages, Computer Control and Robot Software, VAL System, and Language<br>Introduction, Fuzzy set, Fuzzification, Fuzzy Inference Rule Base, Defuzzification, Applications of Fuzzy Logic in Robotics. | 8 | L1, L2, L3 |
| | **Total Hours** | **52** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Introduction Robotics - Analysis, Control, Applications | Saeed B. Niku | Wiley India | Second Edition | 2010 |
| 2 | Fundamentals of Robotics | Robert J. Schilling | Pearson | First Edition | 2007 |
| 3 | Introduction to AI robotics | Robin Murphy | PHI | Second Edition | 2000 |
| 4 | Robotics Technology and Flexible Automation | S. R. Deb | TMH | Second Edition | 2002 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | https://onlinelibrary.wiley.com | https://onlinelibrary.wiley.com/doi/abs/10.1111/1467-8659.1140189 | M1-M2 |
| 2 | https://link.springer.com | https://link.springer.com/chapter/10.1007/978-1-4615-2353-6_6 | M6 |
| 3 | http://www.aishack.in | http://www.aishack.in/tutorials/obstacle-avoidance-bug-algorithm/ | M4 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels as per blooms Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Illustrate Representation of Various Robots and there all Specification (Study Experiment) | 2 | L1, L2 |
| 2 | | Demonstrate 5 DOF Articulated Robot through code | 2 | L1, L2 |
| 3 | | Make use of Y,P,R to develop basic Composite Rotation matrix | 2 | L1, L2, L3 |
| 4 | **Design Experiments** | Make use of Y,P,R to develop homogenous Rotation Matrix on basis of CRM | 2 | L1, L2, L3 |
| 5 | | To identify position and orientation of Direct Kinematics of 2/3/4 Axis Robot | 2 | L1, L2, L3 |
| 6 | | To identify configuration space of Inverse kinematics of 2/3/4 Axis Robot | 2 | L1, L2, L3 |
| 7 | | Develop BUG 1 and BUG 2 Algorithm to detect obstacles | 2 | L1, L2, L3 |
| 8 | | Develop Tangent BUG Algorithm to detect obstacles | 2 | L1, L2, L3 |
| 9 | | Apply Run Length Encoding for image compression | 2 | L1, L2, L3 |

| | | | | |
|---|---|---|---|---|
| 10 | | Apply Edge Detection Algorithm on to an image | 2 | L1, L2, L3 |
| 11 | | Apply Shrink and Swell operator on to an image | 2 | L1, L2, L3 |
| 12 | | Apply Rule based Fuzzification Model for Washing Machine Problem | 2 | L1, L2, L3 |
| 13 | **Mini/Minor Projects/ Seminar/ Case Studies** | 1. Design Robot Arm of SCARA Robot<br>2. Surveillance Robot<br>3. Designing a Robot Manipulator for Pre defined Task<br>4. Detect Edge and Obstacle for Robot Motion<br>5. Design a Simulation from Source to Destination using Bounded Deviation Algorithm<br>6. Create a Project to Simulate Task Planning | 6 | L1, L2, L3, L4, L5, L6 |
| | **Total Hours** | | **30** | |

**B.E. Semester–VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="6">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VII</td></tr>
<tr><td colspan="6">Course Name :Institute Level Optional Course-I<br>(Product Life Cycle Management)</td><td colspan="4">Course Code: ILO 7011</td></tr>
<tr><td colspan="6">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="6">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>80</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">MSE: Mid Semester Examination - Paper Duration – 1.5 Hours<br>SEE : Semester End Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="10">Prerequisite: Product Design and Development, Quality and Reliability Engineering</td></tr>
</table>

**Course Objective:** The Course should be able to provide an exposure to new product development program and guidelines for designing and developing a product and apply the knowledge of Product Data Management & PLM strategies.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Illustrate knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation | L1, L2 |
| 2 | Illustrate various approaches and techniques for designing and developing products. | L1,L2 |
| 3 | Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc | L1, L2, L3 |
| 4 | Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant | L1, L2, L3 |
| 5 | Apply Integration of Environmental Aspects in Product Design | L1, L2, L3 |
| 6. | Illustrate knowledge aboutLife Cycle Assessment and Life Cycle Cost Analysis | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Product Lifecycle Management (PLM) and PLM Strategies**<br>Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications<br><br>Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy , Change management for PLM | 10 | L1, L2 |
| 2 | **Product Design**<br>Product Design: Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase, Methodological Evolution in Product Design, Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering and Life Cycle Approach, New Product Development (NPD) and Strategies, Product Configuration and Variant Management, The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process | 9 | L1, L2 |
| 3 | **Product Data Management (PDM)**<br>Product Data Management (PDM):Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation | 7 | L1, L2, L3 |
| 4 | **Virtual Product Development Tools**<br>Virtual Product Development Tools: For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modeling and simulations in Product Design, Examples/Case studies | 7 | L1, L2, L3 |
| 5 | **Integration of Environmental Aspects in Product Design**<br>Integration of Environmental Aspects in Product Design: Sustainable Development, Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design | 6 | L1, L2, L3 |
| 6 | **Life Cycle Assessment and Life Cycle Cost Analysis**<br>Life Cycle Assessment and Life Cycle Cost Analysis: Properties, and Framework of Life Cycle Assessment, Phases of LCA in ISO Standards, Fields of Application and Limitations of Life Cycle Assessment, Cost Analysis and the Life Cycle Approach, General Framework for LCCA, Evolution of Models for Product Life Cycle Cost Analysis. Introduction to Industry 4.0, Design principles and Challenges , Applications of Industry 4.0 | 8 | L1, L2 |
| | **Total Hours** | **39** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Product Lifecycle Management: Paradigm for 21st Century Product Realisation | John Stark | Springer-Verlag | - | 2004 |
| 2 | Product Design for the environment-A life cycle approach | Fabio Giudice, Guido La Rosa, AntoninoRisitano | Taylor & Francis | - | 2006 |
| 3 | Product Life Cycle Management | SaaksvuoriAntti, ImmonenAnselmie | Springer, Dreamtech | - | - |
| 4 | Product Lifecycle Management: Driving the next generation of lean thinking | Michael Grieve | Tata McGraw-Hill, | - | 2006 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.nptel.ac.in | https://nptel.ac.in/courses/110104070/9 | M1-M6 |
| 2 | www.amieindia.in | https://www.amieindia.in/study-materials/product-life-cycle.pdf | M1, M5, M6 |

**B.E. Semester–VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="5">B.E. ( Computer Engineering )</td><td colspan="5">B.E. SEM : VII</td></tr>
<tr><td colspan="5">Course Name :Institute Level Optional Course-I(Reliability Engineering)</td><td colspan="5">Course Code: ILO 7012</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="5">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="5">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>80</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">MSE: Mid Semester Examination - Paper Duration – 1.5 Hours<br>SEE : Semester End Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="10">Prerequisite: Product Design and Development, Quality and Reliability Engineering</td></tr>
</table>

**Course Objective:** To impart various aspects of probability theory, system reliability, and maintainability, availability and FMEA procedure.

**Course Outcomes : Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive Levels as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand and apply the concept of Probability to engineering problems | L1,L2,L3 |
| 2 | Apply various reliability concepts to calculate different reliability parameters | L1,L2,L3,L4 |
| 3 | 3Estimate the system reliability of simple and complex systems | L1,L2,L3 |
| 4 | Carry out a Failure Mode Effect and Criticality Analysis | L1,L2,L3,L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs | Cognitive Levels as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Probability theory<br>Probability: Standard definitions and concepts; Conditional Probability, Baye's Theorem. Probability Distributions: Central tendency and Dispersion; Binomial, Normal, Poisson, Weibull, Exponential, relations between them and their significance. Measures of Dispersion: Mean, Median, Mode, Range, Mean Deviation, Standard Deviation, Variance, Skewness and Kurtosis. | 8 | L1,L2,L3 |
| 2 | Reliability Concepts | 08 | L1,L2,L3 |

| | | | |
|---|---|---|---|
| | Reliability Concepts: Reliability definitions, Importance of Reliability, Quality Assurance and Reliability, Bath Tub Curve.<br>Failure Data Analysis: Hazard rate, failure density, Failure Rate, Mean Time ToFailure (MTTF), MTBF, Reliability Functions.<br>Reliability Hazard Models: Constant Failure Rate, Linearly increasing, TimeDependent Failure Rate, Weibull Model. Distribution functions and reliability analysis. | | |
| 3 | System Reliability:<br>System Reliability: System Configurations: Series, parallel, mixed configuration, k out<br>of n structure, Complex systems | 06 | L1,L2,L3,L4 |
| 4 | Reliability Improvement:<br>Reliability Improvement: Redundancy Techniques: Element redundancy, Unit redundancy, Standby redundancies. Markov analysis.<br>System Reliability Analysis – Enumeration method, Cut-set method, Success, Path method, Decomposition method. | | L1,L2 |
| 5 | Maintainability and Availability<br>Maintainability and Availability: System downtime, Design for Maintainability: Maintenance requirements, Design methods: Fault Isolation and self-diagnostics, Parts standardization and Interchangeability, Modularization and Accessibility, Repair Vs Replacement.<br>Availability – qualitative aspects. | 5 | L1,L2,L3 |
| 6 | **Failure Mode, Effects and Criticality Analysis:**<br>Failure mode effects analysis: severity/criticality analysis, FMECA examples. Fault tree construction, basic symbols, development of functional reliability block diagram, Fau1t tree analysis and Event tree Analysis | 5 | L1,L2 |
| | **Total Hours** | **39** | |

## Books and References:

| S. No | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Reliability Engineering", | L.S. Srinath, | "Affiliated East-Wast Press (P) Ltd | 3rdEdition | 1985 |
| 2 | "Reliability and Maintainability Engineering | Charles E. Ebeling | Tata McGraw Hill. | 4th Edition | 2015 |
| 3 | Engineering Reliability | B. S. Dhillion C. Singh, | John Wiley & Sons | 5th edition | 1980 |
| 4 | Practical Reliability Engg.", | P.D.T. Conor | John Wiley & Sons | 3rd Edition<br>1985. | |
| 5. | Reliability in Engineering Design | K.C. Kapur, L.R. Lamberson | John Wiley & Sons. | 3rdEdition | 1989 |
| 6. | Probability and Statistics | Murray R. Spiegel | Tata McGraw-Hill Publishing Co. Ltd. | 5th edition | 1980 |

**B.E. Semester–VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="5">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VII</td></tr>
<tr><td colspan="5">Course Name :Institute Level Optional Course-I(Management Information System)</td><td colspan="4">Course Code :ILO 7013</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>80</td><td>-</td><td>-</td></tr>
<tr><td colspan="9">IA: In-Semester Assessment - Paper Duration – 1 Hour<br>ESE: End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="9">Prerequisite: Database Design and Management</td></tr>
</table>

**Course Objective:** The course intends to deliver the role of Management in Information Systems & to understand the impact of these systems within an Organization to improve business performance and decision making. It analyzes typical functional information systems, principal tools and technologies for accessing information from databases & interpreting Ethical issues & Privacy for the same.

**Course Outcomes :Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Explain how information systems Transform Business | L1, L2 |
| 2 | Understand about Data and Knowledge Management | L1, L2, L3 |
| 3 | Analyze the Ethical issues and Privacy in Information Systems | L1, L2, L3, L4 |
| 4 | Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making | L1, L2, L3 |
| 5 | Analyze the types of systems used for enterprise-wide knowledge management and how they provide value for businesses | L1, L2, L3, L4 |
| 6 | Analyze the impact of information systems have on an organization | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction To Information Systems (IS)**<br>Computer Based Information Systems, Impact of IT on organizations, Importance of IS to Society. Organizational Strategy, Competitive Advantages and IS | 4 | L1, L2 |
| 2 | **Data and Knowledge Management**<br>Database Approach, Big Data, Data warehouse and Data Marts, Knowledge Management Business intelligence (BI): Managers and Decision Making, BI for Data analysis and Presenting Results | 7 | L1, L2, L3 |
| 3 | **Ethical issues and Privacy**<br>Information Security. Threat to IS, and Security Controls | 7 | L1, L2, L3, L4 |
| 4 | **Social Computing (SC)**<br>Web 2.0 and 3.0, SC in business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce – B2B B2C. Mobile commerce. | 7 | L1, L2, L3 |
| 5 | **Wired and Wireless Technology**<br>Computer Networks Wired and Wireless Technology, Pervasive computing, Cloud computing model. | 6 | L1, L2, L3, L4 |
| 6 | **Information System within Organization**<br>Transaction Processing Systems, Functional Area Information System, ERP and ERP support of Business Process. Acquiring Information Systems and Applications: Various System development life cycle models | 8 | L1, L2, L3, L4 |
| | **Total Hours** | **39** | |

## Books and References:

| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1. | Management Information Systems | Kelly Rainer, Brad Prince | Wiley | Sixth Edition | 2011 |
| 2. | Management Information Systems | K.C. Laudon and J.P. Laudon | Prentice Hall | Tenth Edition | 2007 |
| 3. | Managing Information Systems: Strategy and Organization | D. Boddy, A. Boonstra | Prentice Hall | Tenth Edition | 2008 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1. | https://www.tutorialspoint.com/index.htm | https://www.tutorialspoint.com/management_information_system/ | M1 |
| 2. | https://www.tutorialspoint.com/index.htm | https://www.tutorialspoint.com/management_information_system/information_need_objective.htm | M2 |
| 3. | https://www.tutorialspoint.com/index.htm | https://www.tutorialspoint.com/management_information_system/mis_security_and_ethical_issues.htm | M3 |
| 4. | https://www.tutorialspoint.com/index.htm | https://www.tutorialspoint.com/management_information_system/system_development_life_cycle.htm | M4 |
| 5. | https://pressbooks.com/ | https://bus206.pressbooks.com/chapter/chapter-13-future-trends-in-information-systems/ | M5 |
| 6. | https://www.tutorialspoint.com/index.htm | https://www.tutorialspoint.com/management_information_system/business_continuity_planning.htm | M6 |

## List of Practical/ Experiments: A

**B.E. Semester–VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VII</td></tr>
<tr><td colspan="7">Course Name :Institute Level Optional Course-I<br>(Design of Experiments)</td><td colspan="4">Course Code :ILO 7014</td></tr>
<tr><td colspan="7">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="7">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>80</td><td>-</td><td>-</td></tr>
<tr><td colspan="9">IA: In-Semester Assessment - Paper Duration – 1 Hour<br>ESE: End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="9">Prerequisite:</td></tr>
</table>

**Course Objective :** The course intends to study issues and principles of Design of Experiments (DOE) and list the guidelines for designing experiments to become familiar with methodologies that can be used in conjunction with experimental designs for robustness and optimization

**Course Outcomes : Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Plan data collection, to turn data into information and to make decisions that lead to appropriate action | L1, L2, L3, L4 |
| 2 | Apply the methods taught to real life situations | L1, L2, L3 |
| 3 | Plan, analyze, and interpret the results of experiments | L1, L2, L3, L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction**<br>Strategy of Experimentation, Typical Applications of Experimental Design, Guidelines for Designing Experiments, Response Surface Methodology | 6 | L1, L2 |
| 2 | **Fitting Regression Models** | | |

| | | | |
|---|---|---|---|
| | Linear Regression Models, Estimation of the Parameters in Linear Regression Models, Hypothesis Testing in Multiple Regression, Confidence Intervals in Multiple Regression, Prediction of new response observation, Regression model diagnostics, Testing for lack of fit. | 8 | L1, L2, L3, L4 |
| 3 | **Two-Level Factorial Designs**<br>The $2^2$ Design, The $2^3$ Design , The General 2k Design, A Single Replicate of the 2k Design, The Addition of Center Points to the 2k Design, Blocking in the 2k Factorial Design Split-Plot Designs | 7 | L1, L2, L3, L4 |
| 4 | **Two-Level Fractional Factorial Designs**<br>The One-Half Fraction of the 2k Design, The One-Quarter Fraction of the 2k Design, The General 2k-p Fractional Factorial Design, Resolution III Designs, Resolution IV and V Designs, Fractional Factorial Split-Plot Designs | 7 | L1, L2, L3, L4 |
| 5 | **Response Surface Methods and Designs**<br>Introduction to Response Surface Methodology, The Method of Steepest Ascent, Analysis of a Second-Order Response Surface, Experimental Designs for Fitting Response Surfaces | 7 | L1, L2, L3, L4 |
| 6 | **Taguchi Approach**<br>Crossed Array Designs and Signal-to-Noise Ratios, Analysis Methods, Robust design examples | 4 | L1, L2, L3 |
| | **Total Hours** | **39** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Response Surface Methodology: Process and Product Optimization using Designed Experiment | Raymond H. Mayers, Douglas C. Montgomery, Christine M. Anderson-Cook | Wiley & Sons | 3rd Edition | 2001 |
| 2 | Design and Analysis of Experiment | D.C. Montgomery | John Wiley & Sons | 5th edition | 2001 |
| 3 | Statics for Experimenters: Design, Innovation and Discovery | George E P Box, J Stuart Hunter, William G Hunter | Wiley | 2nd Ed | 2005 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | https://www2.isye.gatech.edu | https://www2.isye.gatech.edu/~yxie77/isye2028/lecture12.pdf | M1, M2 |
| 2 | http://reliawiki.org | http://reliawiki.org/index.php/Multiple_Linear_Regression_An alysis | M2 |
| 3 | https://www.stat.washington.edu | https://www.stat.washington.edu/pds/stat502/LectureNotes/2k. factorial.intro.pdf www.math.montana.edu/jobo/st578/sec6.pdf | M3,M5 |
| 4 | https://www2.isye.gatech.edu | https://www2.isye.gatech.edu/~jeffwu/isye6413/unit_08_12spring.pdf | M6 |

## List of Practical/ Experiments: NA

**B.E. Semester–VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :**Institute Level Optional Course-I (Operation Research) | | | | | | | **Course Code :**ILO 7015 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **100** |
| 3 | - | - | 3 | 3 | 20 | 80 | - | - | |
| **IA: In-Semester Assessment - Paper Duration – 1 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours** | | | | | | | | | |
| **Prerequisite:** Engineering Mathematics | | | | | | | | | |

**Course Objective:** Course should deliver the optimization techniques so that student should be able to optimize any engineering product or process.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness. | L1, L2, L3 |
| 2 | Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change | L1, L2, L3 |
| 3 | Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems | L1, L2, L3, L4 |
| 4 | Understand the applications of integer programming and a queuing model and compute important performance measures | L1, L2, L3 |
| 5 | Apply conflict between two players | L1, L2, L3, L4 |
| 6 | Apply EOQ model in inventory | L1, L2, L3, L4, L5 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Operations Research**<br>Introduction, , Structure of the Mathematical Model, Limitations of Operations Research<br>**Linear Programming**:<br>Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method Penalty Cost Method or Big M-method, Two Phase Method, Revised simplex method, **Duality**, Primal – Dual construction, Symmetric and Asymmetric Dual, Weak Duality Theorem, Complimentary Slackness Theorem, Main Duality Theorem, Dual Simplex Method, Sensitivity Analysis<br>1.1<br>**Transportation Problem**:<br>Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method<br><br>1.2<br>**Assignment Problem**<br>Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem Routing Problem, Travelling Salesman Problem<br>**Integer Programming Problem**<br>Introduction, Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique. Introduction to Decomposition algorithms. | 14 | L1, L2, L3 |
| 2 | **Queuing models**:<br>queuing systems and structures, single server and multi-server models, Poisson input, exponential service, constant rate service, finite and infinite population | 05 | L1, L2, L3 |
| 3 | **Simulation:**<br>Introduction, Methodology of Simulation, Basic Concepts, Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte-Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of Simulation | 05 | L1, L2, L3, L4 |
| 4 | **Dynamic programming.**<br>Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems. | 6 | L1, L2, L3, L4 |
| | **Game Theory.** | | |

| | | | |
|---|---|---|---|
| 5 | Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games. | 10 | L1, L2, L3 |
| 6 | **Inventory Models**<br>Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model, | 08 | L1, L2, L3, L4, L5 |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Operations Research - An Introduction | Taha, H.A. | Prentice Hall, | 7th Edition, | 2002- |
| 2 | Operations Research: Principles and Practice", | Ravindran, A, Phillips | John Willey and Sons | 2nd Edition - | 2009 |
| 3 | Introduction to Operations Research | Hiller, F. S. and Liebermann | McGraw Hill | - | - |
| 4 | Operations Research | S. D. Sharma | KedarNath Ram Nath-Meerut | - | - |

**B.E. Semester–VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :**Institute Level Optional Course-I(Cyber Security and Laws) | | | | | | | **Course Code :**ILO 7016 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **100** |
| 3 | - | - | 3 | 3 | 20 | 80 | - | - | |
| **IA: In-Semester Assessment - Paper Duration – 1 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours** | | | | | | | | | |
| **Prerequisite:** Cryptography and network security | | | | | | | | | |

**Course Objective:** The Course intends to deliver the fundamentals of cyber law, intellectual property, cybercrimes, trademarks, domain theft, tools used in cyber security and analyze security policies, protocols applied in Indian IT Act 2008, security standards compliances.

**Course Outcomes :Upon completion of the course students will be able to:**

| SN | Course Objectives | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the concept of cybercrime and its effect on outside world | L1,L2 |
| 2 | Interpret and apply IT law in various legal issues , Analyze security challenges and issues | L1,L2,L3 |
| 3 | Understand and analyze various attack using tools like wire shark , key logger etc | L1,L2 |
| 4 | Distinguish different aspects of cyber law | L1,L2,L3,L4 |
| 5 | Study India IT Act and analyze different case studies | L1,L2,L3,L4 |
| 6 | Apply Information Security Standards compliance during software design and development | L1,L2,L3,L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Cybercrime:** | **4** | L1,L2 |
| | Introduction to Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes. | | |
| 2 | **Cyber offenses & Cybercrime:** | **9** | L1,L2 |
| | Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engg, Cyber stalking, Cyber café and Cybercrimes, Bot nets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops | | |
| 3 | **Tools and Methods Used in Cyber line** | **6** | L1,L2 |
| | Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft) | | |
| 4 | **The Concept of Cyberspace** | **8** | L1,L2,L3,L4 |
| | E-Commerce , The Contract Aspects in Cyber Law ,The Security Aspect of Cyber Law ,The Intellectual Property Aspect in Cyber Law , The Evidence Aspect in Cyber Law , The Criminal Aspect in Cyber Law,Global Trends in Cyber Law , Legal Framework for Electronic Data Interchange Law Relating to Electronic Banking ,<br>The Need for an Indian Cyber Law | | |
| 5 | **Indian IT Act.** | **6** | L1,L2,L3,L4 |
| | Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments | | |
| 6 | **Information Security Standard compliances** | 6 | L1,L2,L3,L4 |
| | SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI. | | |
| | **Total Hours** | **39** | |

## Books and References

| Sr. No | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Cyber Security | Nina Godbole, SunitBelapure | Wiley India ,New Delhi | 2nd | 2011 |
| 2 | The Indian Cyber Law | Suresh T. Vishwanathan | Bharat Law House,New Delhi | 2nd | 2015 |
| 3 | Cyber Law & Cyber Crimes | Advocate Prashant Mali | Snow White Publications, Mumbai | 2nd | 2015 |
| 4 | Information Systems Security | Nina Godbole | Wiley India, New Delhi | 2nd | 2014 |
| 5 | Cyber Security &Global Information Assurance | Kennetch J. Knapp | Information Science Publishing. | 1st | 2009 |

**B.E. Semester–VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :**Institute Level Optional Course-I(Disaster Management and Mitigation Measures) | | | | | | | **Course Code :**ILO 7017 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **100** |
| 3 | - | - | 3 | 3 | 20 | 80 | - | - | |
| **IA: In-Semester Assessment - Paper Duration – 1 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours** | | | | | | | | | |
| **Prerequisite:** Analog Communication, Digital Communication, Computer Communication and Networks | | | | | | | | | |

**Course Objective:** Main objective of the subject is to understand causes of different types of disasters, mitigation /rehabilitation measures and existing government policies and agencies.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Get to know natural as well as manmade disaster and their extent and possible effects on the economy. | L1, L2 |
| 2 | Plan of national importance structures based upon the previous history. | L1, L2 |
| 3 | Get acquainted with government policies, acts and various organizational structure associated | L1, L2, L3 |
| 4 | Get to know the simple do's and don'ts in such extreme events and act accordingly. | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| **1** | **Introduction** | **03** | |
| | Definition of Disaster, hazard, global and Indian scenario, generalperspective, importance of study in human life, Direct and indirecteffects of disasters, long term effects of disasters. Introduction to global warming and climate change | | L1, L2 |

| | | | |
|---|---|---|---|
| **2** | **Natural Disaster and Manmade disasters** | **09** | |
| | Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion, Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters | | L1, L2 |
| **3** | **Disaster Management, Policy and Administration** | **06** | |
| | Disaster management: meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management<br>**Policy and administration:**<br>Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations-how to start with and how to proceed in due course of time, study of flowchart showing the entire process. | | L1, L2 |
| **4** | **Institutional Framework for Disaster Management in India** | **06** | |
| | Importance of public awareness, Preparation and execution of emergency management program. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Methods and measures to avoid disasters, Management of casualties, set up of emergency facilities, importance of effective communication amongst different agencies in such situations. Use of Internet and software's for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard. | | L1, L2 |
| **5** | **Financing Relief Measures** | **09** | |
| | Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams. International relief aid agencies and their role in extreme events | | L1, L2 |
| **6** | **Preventive and Mitigation Measures** | **06** | |
| | Pre-disaster, during disaster and post-disaster measures in some events in general .Structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication. Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans. Do's and don'ts in case of disasters and effective implementation of relief aids. | | L1, L2 |
| | **Total** | **39** | |

## Books & References:

| SN | Title | Authors | Publisher | Year |
|---|---|---|---|---|
| 1 | Disaster Management | Harsh K.Gupta | Universities Press Publications | 2003 |
| 2 | Disaster Management: An Appraisal of Institutional Mechanisms in India | O.S.Dagur | Centre for land warfare studies | 2011 |
| 3 | Introduction to International Disaster Management | Damon Copolla | Butterworth Heinemann Elsevier Publications | 2006 |
| 4 | Disaster Management Handbook | Jack Pinkowski | CRC Press Taylor and Francis group | 2008 |
| 5 | Disaster management & rehabilitation | Rajdeep Dasgupta | Mittal Publications | 2007 |
| 6 | Natural Hazards and Disaster Management, Vulnerability and Mitigation | R B Singh | Rawat Publications | 2006 |
| 7 | Concepts and Techniques of GIS | C.P.Lo Albert, K.W. Yonng | Prentice Hall (India) Publications. | 2006 |

**B.E. Semester–VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :**Institute Level Optional Course-I(Energy Audit and Management) | | | | | | | **Course Code :**ILO 7018 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **100** |
| 3 | - | - | 3 | 3 | 20 | 80 | - | - | |
| **IA: In-Semester Assessment - Paper Duration – 1 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours** | | | | | | | | | |
| **Prerequisite:** | | | | | | | | | |

**Course Objective:** The course intends to provide understanding of unwanted source of energy and remedial measures for Energy Conservation through Energy Audit. In addition, subject analyses and highlights the detailed audit procedures of various energy generation plants & establishments, Govt initiatives and bodies associated with Electrical Energy Management.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | To identify and describe present state of energy conservation, security and its importance. | L1, L2 |
| 2 | To identify and describe the basic principles and methodologies adopted in energy audit of energy generation establishment/plants. | L1, L2, L3, L4 |
| 3 | To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities | L1, L2, L3, L4, L5 |
| 4 | To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities | L1, L2, L3, L4, L5 |
| 5 | To analyze the data collected during performance evaluation and recommend energy saving measures | L1, L2, L3, L4, L5, L6 |

**Detailed Syllabus:**

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| **1** | **Energy Scenario** | **05** | L1 |
| | Present Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy Security, Energy Conservation and its Importance, EnergyConservationAct-2001 and its Features. Basics of Energy and its various forms, Material and Energy balance | | |
| **2** | **Energy Audit Principles** | **08** | L1, L2, L3 |
| | Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Benchmarking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution. Elements of monitoring & targeting; Energy audit Instruments; Data and information-analysis.<br><br>Financial analysis techniques: Simple payback period, NPV, Return on investment (ROI), Internal rate of return (IRR) | | |
| **3** | **Energy Management and Energy Conservation in Electrical System** | **05** | L1, L2, L3, L4 |
| | Electricity billing, Electrical load management and maximum demand Control; Power factor improvement, Energy efficient equipment's and appliances, star ratings.<br>**Energy efficiency measures in lighting system, Lighting control:** Occupancy sensors, daylight integration, and use of intelligent controllers.<br>**Energy conservation opportunities in**: water pumps, industrial drives, induction motors, motor retrofitting, soft starters, variable speed drives. | | |
| **4** | **Energy Management and Energy Conservation in Thermal Systems** | **08** | L1, L2, L3, L4 |
| | Review of different thermal loads; Energy conservation opportunities in: Steam distribution system, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system. General fuel economy measures in Boilers and furnaces, Waste heat recovery, use of insulation- types and application. HVAC system: Coefficient of performance, Capacity, factors affecting Refrigeration and Air Conditioning system performance and savings opportunities. | | |

| | | | |
|---|---|---|---|
| **5** | **Energy Performance Assessment** | **07** | L1, L2, L3, L4, L5 |
| | On site Performance evaluation techniques, Case studies based on: Motors and variable speed drive, pumps, HVAC system calculations; Lighting System: Installed Load Efficacy Ratio (ILER) method, Financial Analysis. | | |
| **6** | **Energy conservation in Buildings** | **06** | L1, L2, L3, L4, L5 |
| | Energy Conservation Building Codes (ECBC): Green Building, LEED rating, Application of Non-Conventional and Renewable Energy Sources | | |
| | **Total** | **39** | |

**Books & References:**

| SNo. | Title | Authors | Publisher | Edition |
|---|---|---|---|---|
| 1 | Handbook of Electrical Installation Practice | Geofry Stokes, | Blackwell Science | 2003 |
| 2 | Designing with light: Lighting Handbook | Anil Valia | Lighting System | 2010 |
| 3 | Energy Management Handbook | W.C. Turner | John Wiley and Sons | 2007 |
| 4 | Handbook on Energy Audits and Management | Edited by A. K. Tyagi | Tata Energy Research Institute (TERI). | 2017 |
| 5 | Energy Management Principles | C.B.Smith | Pergamon Press | 2015 |
| 6 | Energy Conservation Guidebook | Dale R. Patrick, S. Fardo, Ray E. Richardson | Fairmont Press | 2015 |
| 7 | Handbook of Energy Audits | Albert Thumann, W. J. Younger, T. Niehus, | CRC Press | 2017 |

**Online References:**

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | energymanagertraining | www.energymanagertraining.com | M3 |
| 2 | bee-india.nic | www.bee-india.nic.in | M2 |

**B.E. Semester–VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :**Institute Level Optional Course-I(Development Engineering) | | | | | | | **Course Code :**ILO 7019 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **100** |
| 3 | - | - | 3 | 3 | 20 | 80 | - | - | |
| **IA: In-Semester Assessment - Paper Duration – 1 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours** | | | | | | | | | |
| **Prerequisite:** Civics, Ethics | | | | | | | | | |

**Course Objectives:** Course intend deliver introduction to characteristics of rural Society and the Scope, Nature and Constraints of rural Development & exploration of human values 'good' professional, a 'good' society and a 'good life' in the context of work life and the personal life of modern Indian professionals.

**Course Outcomes :Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Apply knowledge for Rural Development. | L1, L2 |
| 2 | Apply knowledge for Management Issues.. | L1,L2 |
| 3 | Apply knowledge for Initiatives and Strategies | L1, L2, L3 |
| 4 | Develop acumen for higher education and research. | L1, L2, L3 |
| 5 | Master the art of working in group of different nature. | L1, L2, L3 |
| 6 | Develop confidence to take up rural project activities independently | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Introduction to Rural Development<br>Introduction to Rural Development Meaning, nature and scope of development; Nature of rural society in India; Hierarchy of settlements; Social, economic and ecological constraints for rural development Roots of Rural Development in India Rural reconstruction and Sarvodaya programme before independence; Impact of voluntary effort and Sarvodaya Movement on rural development; Constitutional direction, directive principles; Panchayati Raj - beginning of planning and community development; National extension services. | 10 | L1, L2 |
| 2 | Rural Development Initiatives<br>Post-Independence rural Development Balwant Rai Mehta Committee - three tier system of rural local Government; Need and scope for people's participation and Panchayati Raj; Ashok Mehta Committee - linkage between Panchayati Raj, participation and rural development | 9 | L1, L2 |
| 3 | Rural Development Initiatives<br>. Rural Development Initiatives in Five Year Plans Five Year Plans and Rural Development; Planning process at National, State, Regional and District levels; Planning, development, implementing and monitoring organizations and agencies; Urban and rural interface - integrated approach and local plans; Development initiatives and their convergence; Special component plan and sub-plan for the weaker section; Micro-eco zones; Data base for local planning; Need for decentralized planning; Sustainable rural development. | 7 | L1, L2, L3 |
| 4 | **Amendments**<br>Post 73rd Amendment Scenario 73rd Constitution Amendment Act, including - XI schedule, devolution of powers, functions and finance; Panchayati Raj institutions - organizational linkages; Recent changes in rural local planning; Gram Sabha - revitalized Panchayati Raj; Institutionalization; resource mapping, resource mobilization including social mobilization; Information Technology and rural planning; Need for further amendments. | 7 | L1, L2, L3 |
| 5 | Values and Science and Technology<br>Values and Science and Technology Material development and its values; the challenge of science and technology; Values in planning profession, research and education.<br>Types of Values Psychological values — integrated personality; mental health; Societal values — the modern search for a good society; justice, democracy, rule of law, values in the Indian constitution; Aesthetic values — perception and enjoyment of beauty; Moral and ethical values; nature of moral judgment; Spiritual values; different concepts; secular spirituality; Relative and absolute values; Human values— humanism and human values; human rights; human values as freedom, creativity, love and wisdom. | 6 | L1, L2, L3 |
| 6 | Ethics<br>Ethics Canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility; Work ethics; Professional ethics; Ethics in planning profession, research and education | 8 | L1, L2 |
| | **Total Hours** | **39** | |

## Books and References:

| Sr.No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Village Planning and Rural Development | ITPI | ITPI | - | - |
| 2 | Human Settlements | Thooyavan, K.R. | MA Publication, Chennai | -- | 2005 |
| 3 | Manual of Integrated District Planning | Planning Commission | Planning Commission | -- | 2006 |
| 4 | Normative Ethics in Planning | How, E. | Journal of Planning Literature | Vol.5, No.2, pp. 123-150 | 2017 |

## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.india.gov.in | https://www.india.gov.in/my-government/constitution-india/amendments/constitution-india-seventy-third-amendment-act-1992 | M1-M4 |

## B.E. Semester–VII

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :**Major Project-I | | | | | | | **Course Code :** CSP701 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| - | - | 6 | 6 | 3 | - | - | 25 | 50 | **75** |
| **IA: In-Semester Assessment - Paper Duration – 1 Hour**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of project (40%) and Attendance/Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** - | | | | | | | | | |

**Course Objective :**The Project work enables students to develop further skills and knowledge gained during the programme by applying them to the analysis of a specific problem or issue, via a substantial piece of work carried out over an extended period. For students to demonstrate proficiency in the design of a research project, application of appropriate research methods, collection and analysis of data and presentation of results.

### Guidelines:

1. **Project Topic:**

- To proceed with the project work it is very important to select a right topic. Project can be undertaken on any subject addressing IT programme. Research and development projects on problems of practical and theoretical interest should be encouraged.
- Project work must be carried out by the group of at least two students and maximum three and must be original.
- Students can certainly take ideas from anywhere, but be sure that they should evolve them in the unique way to suit their project requirements.
- The project work can be undertaken in a research institute or organization/company/any business establishment.
- Student must consult internal guide along with external guide (if any) in selection of topic.
- Head of department and senior staff in the department will take decision regarding selection of projects.
- Student has to submit weekly progress report to the internal guide and whereas internal guide has to keep track on the progress of the project and also has to maintain attendance report. This progress report can be used for awarding term work marks.
- In case of industry projects, visit by internal guide will be preferred.

2. **Project Report Format:**

At the end of semester a project report should preferably contain at least following details:-

- Abstract
- Introduction
- Literature Survey
  - Survey Existing system
  - Limitation Existing system or research gap
  - Problem Statement and Objective
  - Scope
- Proposed System

  - Analysis/Framework/ Algorithm
  - Details of Hardware & Software
  - Design details
  - Methodology (your approach to solve the problem)
- Implementation Plan for next semester
- Conclusion
- References

**3. Term Work:**

Distribution of marks for term work shall be as follows:

a. Weekly Attendance on Project Day
b. Project work contribute
c. Project Report (Spiral Bound)
d. Term End Presentation (Internal)

The final certification and acceptance of TW ensures the satisfactory performance on the above aspects.

**4. Oral & Practical :**

Oral &Practical examination of Project-I should be conducted by Internal and External examiners approved by University of Mumbai. Students have to give presentation and demonstration on the Project I.

**B.E. Semester –VII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **BE (ALL BRANCHES)** | | | | | **SEM: VII** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Research Based Learning 3 | | | | | **Course Code:HSD-CSRBL701** | | | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Assessment/Evaluation Scheme** | | | | |
| **Hours Per Week** | | | | | **Presentation** | | **Report** | | **Term Work** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **IA** | **ESE** | **TW** |
| Audit course evaluated by Teacher Guardian | | | | | | | | | |
| Mid Semester Assessment for Term work will be on continuous basis | | | | | | | | | |
| **Prerequisite:**Subject knowledge, Domain knowledge | | | | | | | | | |

## Course Objectives:

This course is focused to give basic aspects of Research and development, including research methodologies, innovation, IPR, and entrepreneurship.

## Course Outcomes :**Upon completion of the course students will be able to:**

| S.N. | Course Outcome | Cognitive level attainment as per revised Bloom Taxonomy |
|---|---|---|
| 1 | Students will be to publish research paper. | L1, L2, L3,L4 |
| 2 | Student will be able to create new idea for problem solving related to industry or societal issues. | L1, L2, L3,L4 |
| 3 | Students will be to development entrepreneurial thinking with an idea to convert project into product. | L1, L2, L3,L4,l5,L6 |
| 4 | Students will be aware of ethics and plagiarism aspects in technical writing. | L1, L2, L3,L4,l5,L6 |

## Detailed Syllabus:

| Module No. | Topics | Cognitive level attainment as per revised Bloom Taxonomy |
|---|---|---|
| 1 | **Research Publication**<br>Forming interest groups with mentors, Topic Identification, Literature Survey, and Sketching of Idea/Design of Survey, Implementation, and Analysis of Results, Identifying journal /conference for publication conference paper, Publishing of research Paper/Survey paper.<br>**Evaluation by faculty as per format**. | L1, L2, L3,L4 |
| 2 | **Management of Innovation and Technical Change**<br>What is innovation, kinds of Innovation, Innovation as a core business process, Developing an innovation strategy, Sources of innovation, Creating new products and services<br>**Idea competition and evaluation.** | L1, L2, L3,L4 |
| 3 | **Research Ethics, IPR And Scholarly Publishing**<br>Ethical issues; IPR-intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing-IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability.<br>**Evaluation of product feasibility for IPR.** | L1, L2, L3,L4,l5,L6 |
| 4 | **Entrepreneurship**<br>Concepts and practices of technology entrepreneurial thinking and entrepreneurship. Using lectures, case studies, business plans, and student presentations, the course teaches life skills in entrepreneurial thought and action that students can utilize in starting technology companies or executing R&D projects in large companies.<br>**Pitch presentation competition and evaluation** | L1, L2, L3,L4,l5,L6 |

## References:


| Sr. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 3. | Research Methodology Methods and Techniques | C.R. Kothari | New Age International Limited, | 2nd Edition | 2004 |
| 4. | Entrepreneurship Development and Small Business Enterprise | Poornima M. Charantimath | Pearson Education India | 5thEdition | 2005 |
| 3. | Law Relating to Patents, Trade Marks, Copyright, Designs and Geographical Indications | B. L. Wadehra | Universal Law Publishing Co Ltd | Kindle | 2004 |


## Online References:

| Sr. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1. | https://www.statpac.com | https://www.statpac.com/online-software-manual/Basic-Research-Concepts.htm | M1 |
| 2. | https://www.slideshare.net | https://www.slideshare.net/25Mksp/management-technology-innovation-change | M2 |
| 3. | https://www.eng.ufl.edu | https://www.eng.ufl.edu/leadership/wp-content/uploads/sites/7/2015/02/Engineering-Entrepreneurship-Course-Overview.pdf | M4 |
| 4. | https://www.vesalius.edu | https://www.vesalius.edu/wp-content/uploads/2016/11/BUS213G-S15.pdf | M3 |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. (Computer Engineering)** | | | | | | | **B.E. SEM: VIII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Human Machine Interaction | | | | | | | **Course Code:** CSC801 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **150** |
| 4 | - | 2 | 6 | 5 | 20 | 80 | 25 | 25 | |
| **IA: In-Semester Assessment - Paper Duration – 1 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Web Technologies, Software Engineering | | | | | | | | | |

**Course Objective:** The course intends to deliver fundamental knowledge about GUI design guidelines and apply the knowledge to design intuitive GUI for real life applications.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No | Course Outcome | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the foundation of human machine interaction. | L1, L2 |
| 2 | Analyze the importance of human psychology effective user friendly interfaces. | L1, L2, L3, L4 |
| 3 | Evaluate UI design for intuitive GUI and justify. | L1, L2, L3, L4, L5 |
| 4 | Design interactive screens using different applications to meet user requirements. | L1, L2, L3, L4, L5, L6 |
| 5 | Synthesize interactive design process in real world mobile applications. | L1, L2, L3, L4, L5, L6 |
| 6 | Create the machine interaction application for social and technical task. | L1, L2, L3, L4, L5, L6 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Foundations of HMI**<br>The Human: History of User Interface Designing, I/O channels, Hardware, Software and Operating environments, The Psychopathology of everyday Things, Psychology of everyday actions, Reasoning and problem solving. The computer: Devices, Memory, processing and networks. Interaction: Models, frameworks, Ergonomics, styles, elements, interactivity, Paradigms. | 6 | L1, L2 |

| | | | |
|---|---|---|---|
| 2 | **Design & Software Process**<br>Mistakes performed while designing a computer system, Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds .Interactive Design basics, process, scenarios, navigation, Iteration and prototyping. HMI in software process: software life cycle, usability engineering, Prototyping in practice, design rationale. Design rules: principles, standards, guidelines, rules. Recognize the goals, Goal directed design process. Evaluation Techniques: Universal Design | 10 | L1, L2, L3, L4 |
| 3 | **Graphical User Interface**<br>The graphical User Interface: Popularity of graphics, the concept of direct manipulation, graphical systems, Characteristics. Web user Interface: Interface popularity, characteristics. The merging of graphical Business systems and the Web. Principles of user interface design. | 6 | L1, L2, L3, L4, L5 |
| 4 | **Screen Designing**<br>Design goals , Screen planning and purpose, organizing screen elements, ordering of screen data and content , screen navigation and flow, Visually pleasing composition, amount of information, focus and emphasis, presentation information simply and meaningfully, information retrieval on web, statistical graphics, Technological Consideration in interface design. | 14 | L1, L2, L3, L4, L5, L6 |
| 5 | **Interface Design For Mobile Devices**<br>Mobile Ecosystem: Platforms, Application frameworks: Types of Mobile Applications: Widgets, Applications, Games, Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. | 8 | L1, L2, L3, L4, L5, L6 |
| 6 | **Interaction Styles And Communication**<br>Windows: Characteristics, Components, Presentation styles, Types of Windows, Management, operations. Text messages: Words, Sentences, messages and text words, Text for web pages. Icons, Multimedia and colors. | 8 | L1, L2, L3, L4, L5, L6 |
| | **Total Hours** | **52** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Human Computer Interaction. | Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale | Pearson | 3rd Edition | 2004 |
| 2 | The Essential Guide to User Interface Design | Wilbert O. Galitz | Wiley publication | 3rd Edition | 2007 |
| 3 | About Face3: Essentials of Interaction design | Alan Cooper, Robert Reimann, David Cronin, | Wiley publication | 3rd Edition | 2007 |
| 4 | Designing with the mind in mind | Jeff Johnson | Morgan Kaufmann Publication | 2nd Edition | 2015 |
| 5 | Design of everyday things | Donald A. Normann | Peter Lindsay | 3rd Edition | 2002 |
| 6 | Mobile Design and Development | Brian Fling | O'Reilly | 1st Edition | 2009 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | https://www.machinedesign.com | https://www.machinedesign.com/iot/what-are-human-machine-interfaces-and-why-are-they-becoming-more-important | M1 |
| 2 | https://www.nngroup.com | https://www.nngroup.com/articles/ | M2 - M6 |

**List of Practical/ Experiments:**

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | **Basic Experiments** | (a) Sketch interface for Mobile app/ Website that can teach mathematics to children of 4-5 years age in schools in Rural /Urban Sector<br>(b) Sketch interface for Mobile App/Website that can help people to sell their handmade products in metro cities<br>( c)Sketch interface for ATM machine/KIOSK screen for rural people<br>(d )Sketch interface for Mobile App/Website to get an experience for passengers whose flight /train is delayed. | 2 | L1, L2, L3, L4 |
| 2 | **Design Experiments** | Design an UI application for Institute event management. | 2 | L1, L2, L3, L4, L5, L6 |
| 3 | | Design of User interface for the system using various interaction styles. | 2 | L1, L2, L3, L4, L5, L6 |
| 4 | | Redesign the interface to minimize the screen complexity by calculating screen complexity of existing Graphical User Interface. | 2 | L1, L2, L3, L4, L5, L6 |
| 5 | | Design appropriate icons pertaining to a given domain. (e.g. Greeting cards) | 2 | L1, L2, L3, L4, L5, L6 |
| 6 | | Design a interface for Home appliances | 2 | L1, L2, L3, L4, L5, L6 |
| 7 | | Design a navigator for a student new in your Institute. | 2 | L1, L2, L3, L4, L5, L6 |
| 8 | | Develop an application using interactive data access through Graphics (QR, BAR Code, Image etc.) and generating a print form. | 4 | L1, L2, L3, L4, L5, L6 |
| 9 | | Develop an application by using statistical graphics and its use in visualization. | 4 | L1, L2, L3, L4, L5, L6 |
| 10 | **Mini Projects** | • Mobile App for a person new in tourist city/ village.<br>• Motor paralysis for disabled people<br>• KIOSK for hospital/school/educational campus/National Institute.<br>• Personal website for an Artisan.<br>• App for Nutrition Management.<br>• App for Disease Prevention & Treatment. | 8 | L1, L2, L3, L4, L5, L6 |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VIII</td></tr>
<tr><td colspan="7">Course Name : Distributed Computing</td><td colspan="4">Course Code : CSC802</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>4</td><td>-</td><td>2</td><td>6</td><td>5</td><td>20</td><td>80</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Computer Basics, Procedural Programming Languages</td></tr>
</table>

**Course Objective:** The objective of the course is to study contemporary knowledge in distributed systems and able to analyze and design distributed applications. It provide skill to measure the performance of distributed synchronization algorithms

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Demonstrate knowledge of the basic elements and concepts related to distributed system technologies. | L1,L2,L3 |
| 2 | Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware. | L1,L2,L3,L4,L5, L6 |
| 3 | Analyze the various techniques used for clock synchronization and mutual exclusion | L1,L2,L3,L4 |
| 4 | Demonstrate the concepts of Resource and Process management and synchronization algorithms | L1,L2,L3,L4 |
| 5 | Demonstrate the concepts of Consistency and Replication Management | L1,L2,L3,L4 |
| 6 | Apply the knowledge of Distributed File System to analyze various file systems like NFS, AFS and experience in building large-scale distributed applications. | L1,L2,L3,L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Distributed Systems**<br>Characterization of Distributed Systems: Issues, Goals, and Types of distributed systems, Distributed System Models, Hardware concepts,<br><br>Software Concept. Middleware: Models of Middleware, Services offered by middleware, Client Server model. | 04 | L1,L2,L3 |
| 2 | **Communication**<br>Layered Protocols, Interprocess communication (IPC): MPI, Remote Procedure Call (RPC), Remote Object Invocation, Remote Method Invocation (RMI), Message Oriented Communication, Stream Oriented Communication,<br>Group Communication | 06 | L1,L2,L3,L4,L5, L6 |
| 3 | **Synchronization**<br>Clock Synchronization, Logical Clocks, Election Algorithms, Mutual Exclusion, Distributed Mutual Exclusion-Classification of mutual Exclusion Algorithm, Requirements of Mutual Exclusion Algorithms, Performance measure.<br>Non Token based Algorithms: Lamport Algorithm, Ricart Agrawala's Algorithm, Maekawa's Algorithm.<br>Token Based Algorithms: Suzuki-Kasami's Broardcast Algorithms, Singhal's Heurastic Algorithm, Raymond's Tree based Algorithm,<br><br>Comparative Performance Analysis. | 12 | L1, L2, L3, L4 |
| 4 | **Resource and Process Management**<br>Desirable Features of global Scheduling algorithm, Task assignment<br><br>Approach, Load balancing approach, load sharing approach.<br><br>Introduction to process management, process migration, Threads, Virtualization, Clients, Servers, Code Migration | 08 | L1, L2, L3, L4 |
| 5 | **Consistency, Replication and Fault Tolerance**<br>Introduction to replication and consistency, Data-Centric and Client-<br><br>Centric Consistency Models, Replica Management<br><br>Fault Tolerance: Introduction, Process resilience, Reliable client-server and group communication, Recovery. | 10 | L1, L2, L3, L4 |
| 6 | **Distributed File Systems and Name Services**<br>Introduction and features of DFS, File models, File Accessing models,<br><br>File-Caching Schemes, File Replication, Case Study: Distributed File Systems (DSF), Network File System (NFS), Andrew File System (AFS)<br><br>Introduction to Name services and Domain Name System, Directory<br><br>Services, Case Study: The Global Name Service, The X.500 Directory Service. Designing Distributed Systems: Google Case Study. | 12 | L1, L2, L3, L4 |
| | **Total Hours** | **52** | |

## Books and References:

| SN | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Distributed Systems: Principles and Paradigms | Andrew S. Tanenbaum and Maarten Van Steen | Pearson Education. | 2nd Edition | - |
| 2 | Distributed Systems: Concepts and Design | George Coulouris, Jean Dollimore, Tim Kindberg, | Pearson education | 4th Edition | 2005 |
| 3 | Distributed Systems: Principles and Paradigms | Andrew S. Tanenbaum and Maarten Van Steen | Pearson Education. | 2nd Edition | - |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.cs.cmu.edu | www.cs.cmu.edu › slides › lec_3 | M1 |
| 2 | https://www.geeksforgeeks.org | https://www.geeksforgeeks.org/interprocess-communication-in-distributed-systems/ | M2 |
| 3 | www.tutorialspoint.com | https://www.tutorialspoint.com › Distributed-Systems | M1-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Study of Distributed Computing system architecture and explain with various application like university , Banking system | 2 | L1, L2, L3 |
| 2 | | Built a Program for Client/server using RPC/RMI | 2 | L1, L2, L3 |
| 3 | | Demonstrate a program for Inter-process communication | 2 | L1, L2, L3 |
| 4 | **Design Experiments** | Develop a program for Group Communication | 2 | L1, L2, L3 |
| 5 | | Develop a program for Election Algorithm | 2 | L1, L2, L3 |
| 6 | | Develop a program for Clock Synchronization algorithms | 2 | L1, L2, L3 |
| 7 | | Design an program to illustrate token based algorithm | 2 | L1, L2, L3 |
| 8 | | Design an program to illustrate non token based algorithm | 2 | L1, L2, L3 |
| 9 | | Develop a program for Mutual Exclusion Algorithm | 2 | L1, L2, L3, |
| 10 | | Develop a program for Load Balancing Algorithm. | 2 | L1, L2, L3 |
| 11 | | Develop a program for Distributed File System | 2 | L1, L2, L3 |
| 12 | | Develop a program for Name Resolution protocol. | 2 | L1, L2, L3 |
| 13 | **Mini/Minor Projects/ Seminar/ Case Studies** | **Case study:**<br>• **Facebook Distributed file system**<br>• **Design And Development Of The Data Synchronization/Clock synchronization**<br>• **CORBA Architecture**<br><br>**Mini Project:**<br>4. Dynamic routing with security consideration Java Project | 6 | L1, L2, L3,L4,L5,L6 |

| | | | | |
|---|---|---|---|---|
| | | 5. Adaptive Programming Model for Fault Tolerant Distributed Computing Maze generator<br>6. Distributed Cache Updated System for DSR Employee Record System<br>7. Idea on Stock Market Simulation Game<br>8. Project Idea on Replicated File System<br>9. Distributed System on One Lane Bridge Project | | |
| | | **Total Hours** | **30** | |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="8">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VIII</td></tr>
<tr><td colspan="8">Course Name : Department Level Optional Course -IV (High Performance Computing)</td><td colspan="4">Course Code : CSDLO 8011</td></tr>
<tr><td colspan="8">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="8">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">175</td></tr>
<tr><td>4</td><td>-</td><td>2*</td><td>6</td><td>5</td><td>20</td><td>80</td><td>25</td><td>50</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Computer Basics, Procedural Programming Languages</td></tr>
</table>

**Course Objective:** The objective of the course is to study parallel processing as it pertains to high-performance computing and able to design, develop and analyze parallel programs on high performance computing resources using parallel programming paradigms.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Illustrate parallel processing approaches | L1,L2 |
| 2 | Describe different parallel processing platforms involved in achieving High Performance Computing. | L1,L2 |
| 3 | Compare different design issues in parallel programming. | L1,L2,L3,L4 |
| 4 | Discuss parallel programming issues and Develop parallel programs | L1,L2,L3,L4 |
| 5 | Analyze the performance measures of parallel programs | L1,L2,L3,L4 |
| 6 | Describe parallel programming using message passing paradigm using open source APIs. | L1,L2,L3,L4,L5 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction**<br>Introduction to Parallel Computing: Motivating Parallelism, Scope of Parallel Computing, Levels of parallelism (instruction, transaction, task, thread, memory, function) Classification Models: Architectural Schemes (Flynn's, Feng's, Handler's) and Memory access (Shared Memory, Distributed Memory, Hybrid Distributed Shared Memory) Parallel Architectures: Pipeline Architecture, Array Processor, Multiprocessor Architecture, Systolic Architecture, Data Flow Architecture. | 8 | L1,L2 |
| 2 | **Pipeline Processing**<br>Introduction, Pipeline Performance, Arithmetic Pipelines, Pipeline instruction processing, Pipeline stage design, Hazards, Dynamic instruction scheduling | 6 | L1,L2 |
| 3 | **Parallel Programming Platforms**<br>Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor & Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines | 8 | L1, L2, L3, L4 |
| 4 | **Parallel Algorithm Design**<br>Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Parallel Algorithm Models, Examples of Parallel Algorithms (Bitonic Sort, the parallel formulation of odd-even transposition sort) | 14 | L1, L2, L3, L4 |
| 5 | **Performance Measures**<br>Performance Measures : Speedup, execution time, efficiency, cost, scalability, Effect of granularity on performance, Scalability of Parallel Systems, Amdahl's Law, Gustavson's Law, Performance Bottlenecks | 6 | L1, L2, L3, L4 |
| 6 | **HPC Programming**<br>Programming Using the Message-Passing Paradigm: Principles of Message Passing Programming, The Building Blocks: Send and Receive Operations<br>MPI: the Message Passing Interface, Topology and Embedding, Overlapping Communication with Computation, Collective Communication and Computation Operations, Introduction to OpenMP | 10 | L1, L2, L3, L4, L5 |
| | **Total Hours** | **52** | |

## Books and References:

| Sr no. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Introduction to Parallel Computing | Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar | Pearson Education | 2nd Edition | 2007 |
| 2 | Parallel Computing | M. R. Bhujade | New Age International Publishers | 2nd Edition | 2009 |
| 3 | Advanced Computer Architecture: Parallelism, Scalability, and Programmability. | Kai Hwang, Naresh Jotwani | McGraw Hill | 2nd edition | 2010 |
| 4 | Introduction to High Performance Computing for Scientists and Engineers. | Georg Hager, Gerhard Wellein | Taylor & Francis | Special Indian Edition | 2011 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.vssut.ac.in | www.vssut.ac.in › lecture_notes › lecture1428643084 | M1-M6 |
| 2 | hpc.llnl.gov | https://hpc.llnl.gov › training › tutorials | M M1-M6 |
| 3 | www.researchgate.net | https://www.researchgate.net › publication › 260724344_An_Introduction | M1-M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | Basic Experiments | Develop a Program for Execution of Simple Hello world program on MPI platform | 2 | L1, L2, L3 |
| 2 | | Develop a program to send data and receive data to/from processors using MPI | 2 | L1, L2, L3 |
| | | Program illustrating Broadcast of data using MPI | 2 | L1, L2, L3 |
| 3 | Design Experiments | Implement a parallel program to demonstrate the cube of N number within a set range | 2 | L1, L2, L3 |
| 4 | | Write a parallel program for area of a circle/triangle | 2 | L1, L2, L3 |
| 5 | | Implement a program to demonstrate balancing of workload on MPI platform | 2 | L1, L2, L3 |
| 6 | | Using directives of MPI/OpenMP implement parallel programming for calculator application (add, sub, multiplication and division) | 2 | L1, L2, L3 |
| 7 | | Implement Bionic Sort Algorithm. | 4 | L1, L2, L3 |
| 8 | | Implement Parallel Odd Even Transposition Algorithm | 4 | L1, L2, L3 |
| 9 | Case Studies | **Case study:**<br>• HPC and Topological Data Analysis<br>• Software Architecture HPC system | 2 | L1, L2 |
| 10 | Mini/Minor Projects/ | **Mini Project:**<br>**Evaluate performance enhancement of HPC for any of the following:**<br>10. One-Dimensional Matrix-Vector Multiplication<br>11. Single-Source Shortest-Path/<br>12. Sample Sort<br>Two-Dimensional Matrix-Vector Multiplication | 6 | L1, L2, L3, L4, L5, L6 |
| | | **Total Hours** | **30** | |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VIII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :** Department Level Optional Course -IV (Natural Language Processing) | | | | | | | **Course Code :** CSDLO 8012 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination scheme** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **175** |
| 4 | - | 4 | 8 | 6 | 20 | 80 | 25 | 50 | |
| **IA: In-Semester Assessment- Paper Duration – 1 Hours**<br>**ESE :End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Programming Language Basic, Compiler Concepts | | | | | | | | | |

**Course Objective:** The course intends to apply fundamental knowledge of Natural Language Processing and applying knowledge to implement real time problems in fields of natural languages.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | derstand field of natural language processing. | L1, L2 |
| 2 | alyze capabilities and limitations of current natural language technologies, | L1, L2, L3, L4 |
| 3 | ply the model linguistic phenomena with formal grammars. | L1, L2, L3 |
| 4 | alyze and test algorithms for NLP problems | L1, L2, L3, L4 |
| 5 | derstand the mathematical and linguistic foundations underlying approaches to the various areas in NLP | L1, L2 |
| 6 | ply NLP techniques to design real world NLP applications such as machine translation, text egorization, text summarization, information extraction...etc. | L1, L2,L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Natural Language Processing**<br>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 | 9 | L1, L2 |
| 2 | **Word Level Analysis**<br>Morphology analysis –survey of English Morphology, Inflectional<br>morphology & Derivational morphology, Lemmatization, Regular<br>expression, finite automata, finite state transducers (FST) | 5 | L1, L2, L3, L4 |

| | | | |
|---|---|---|---|
| | , Morphological parsing with FST, Lexicon free FST Porter stemmer. N –Grams- N-gram language model, N-gram for spelling correction. | | |
| 3 | **Syntax Analysis**<br>Part-Of-Speech tagging( POS)- Tag set for English ( Penn Treebank ) , Rule based POS tagging, Stochastic POS tagging, Issues –Multiple tags & words, Unknown words. Introduction to CFG, Sequence labeling: Hidden Markov Model (HMM), Maximum Entropy, and Conditional Random Field (CRF). | 6 | L1, L2, L3 |
| 4 | **Semantic Analysis**<br>Lexical Semantics, Attachment for fragment of English- sentences, noun phrases, Verb phrases, prepositional phrases, Relations among lexemes & their senses –Homonymy, Polysemy, Synonymy, Hyponymy, WordNet, Robust Word Sense Disambiguation (WSD) ,Dictionary based approach | 10 | L1, L2, L3, L4 |
| 5 | **Pragmatics**<br>Discourse –reference resolution, reference phenomenon , syntactic & semantic constraints on co reference | 8 | L1, L2 |
| 6 | **Applications of NLP**<br>Machine translation, Information retrieval, Question answers system, categorization, summarization, sentiment analysis, Named Entity Recognition. | 7 | L1, L2,L3 |
| | **Total Hours** | **45** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Speech and Language Processing | Daniel Jurafsky, James H. Martin | Prentice Hall | Third Edition | 2008 |
| 2 | Foundations of Statistical Natural Language Processing | Christopher D.Manning and Hinrich Schutze, | MIT Press, 1999 | Second Edition | 1999 |
| 3 | Natural Language Processing and Information Retrieval | Siddiqui and Tiwary U.S | Oxford University Press | -- | 2008 |
| 4 | Multilingual natural language processing applications‖ | Daniel M Bikel and Imed Zitouni ― | Peasron | -- | 2013 |
| 5 | Natural Language Processing with Python | Steven Bird, Ewan Klein, | O'Reilly | -- | -- |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.geeksforgeeks.org | https://www.geeksforgeeks.org/fundamentals-of-algorithms/#AnalysisofAlgorithms | M1-M6 |
| 2 | www.tutorialspoint.com | https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm | M1-M3, M6 |
| 3 | www.w3schools.in | https://www.w3schools.in/category/data-structures-tutorial/ | M1,M4 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | Cognitive levels of Bloom's Taxonomy |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Study different steps of Natural Language Processing | 2 | L1,L2 |
| 2 | | Study different NLP Packages/Tools | 2 | L1,L2,L3 |
| 3 | **Design Experiments** | Implement Word Analysis techniques | 2 | L1,L2,L3,L4,L5 |
| 4 | | Implement Word generation techniques | 2 | L1,L2,L3 |
| 5 | | Implement Stop word removal techniques | 2 | L1,L2,L3 |
| 6 | | Implement Stemming in NLP | 2 | L1,L2,L3 |
| 7 | | Implement Morphology POS Tagging and in NLP | 4 | L1,L2,L3 |
| 9 | **Advanced Experiments** | Implement Chunking in NLP and N-gram language model | 4 | L1,L2,L3 |
| 10 | **Mini/Minor Projects/ Seminar/ Case Studies** | 1. Speech Recognition<br>2. Caption Generation<br>3. Machine Translation<br>4. Document Summarization<br>5. Question Answering<br>**6.** Text Classification | 10 | L1,L2,L3,L4,L5 |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="6">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : IV</td></tr>
<tr><td colspan="6">Course Name : Department Level Optional Course –IV<br>(Adhoc Wireless Networks)</td><td colspan="4">Course Code : CSDLO 8013</td></tr>
<tr><td colspan="6">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="6">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">175</td></tr>
<tr><td>4</td><td>-</td><td>4</td><td>8</td><td>6</td><td>20</td><td>80</td><td>25</td><td>50</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Computer Network, Wireless Networking</td></tr>
</table>

**Course Objective:** The course intends to apply knowledge about the architecture of Adhoc Wireless Networks and the protocols used in various network layers. Also, the course discusses the security issues in Adhoc Networks and about Vehicular Adhoc Networks.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Define Adhoc Wireless Networks; describe the characteristics, features of Adhoc networks and discuss the issues in Adhoc Networks | L1, L2 |
| 2 | Describe the concepts of MAC protocols and analyze the issues in designing MAC protocols for Ad Hoc networks. | L1, L2,L3, L4 |
| 3 | Describe the concepts of routing protocols for Adhoc Networks, compare them and analyze the issues in designing routing protocols | L1, L2, L3,L4 |
| 4 | Summarize the concepts of transport layer protocols for Adhoc Networks; interpret the flow control in transport layer of Ad Hoc Networks and investigate the issues in designing transport protocols | L1, L2, L3, L4 |
| 5 | Cite network security requirements in Ad Hoc Networks and examine the issues in security provisioning; summarize the concepts of link layer and network security attacks. | L1, L2, L3 |
| 6 | Describe the concept of VANET; recall and apply the concepts of Adhoc Networks in VANETs. | L1, L2, L3 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction**<br>Introduction to wireless Networks. Characteristics of Wireless channel, Issues in Ad hoc wireless networks, Adhoc Mobility Models: - Indoor and outdoor models, Introduction to Adhoc networks – definition, characteristics features, applications. | 04 | L1, L2 |
| 2 | **MAC protocols for Wireless Ad-Hoc Networks**<br>Introduction, Issues in designing MAC for Wireless Ad-Hoc Networks, Design Goals and classification of MAC for Wireless Ad-Hoc Networks, Contention based MAC protocols for Wireless Ad-Hoc Networks, with reservation mechanisms, scheduling Mechanisms, MAC protocols using directional antennas, Other MAC Protocols, IEEE standards MAC Protocols: 802.15.1(WPAN based on Bluetooth), 802.15.4 (WSN/Zigbee), 802.15.6 (WBAN). | 10 | L1, L2, L3,L4 |
| 3 | **Routing Protocols for Wireless Ad-Hoc Networks**<br>Introduction, Issues in designing a routing protocol for Wireless Ad-Hoc Networks, Classification of routing protocols, Table driven routing protocols like DSDV, WRP,On- demand routing protocols like ABR, DSR, TORA, AODV, etc., Hybrid Routing Protocols: ZRP, Routing Protocols with efficient flooding mechanism, Hierarchical Routing Protocols, Power aware routing protocols. | 8 | L1, L2,L3, L4 |
| 4 | **Transport Layer**<br>Transport layer protocols for Ad hoc wireless Networks: Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks, Classification of transport layer solutions: Split Approach , End-to-End approach :TCP-F,TCP-ELFN, Ad-Hoc TCP, TCP Buffering capability and Sequencing information, End-to-End Quality of Service. | 12 | L1, L2, L3, L4 |
| 5 | **Security**<br>Security attacks in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning, Link Layer security attacks: 802.11 MAC , WPA and variations, Network Security Attacks: Routing Protocol Attacks: attacks using falsifying route errors and broadcasting falsifying routes, spoofing attacks, Rushing attacks, Secure routing in Ad hoc wireless Networks. | 8 | L1, L2, L3 |
| 6 | **Vehicular Ad-Hoc Network (VANET)**<br>Introduction: Challenges and Requirements, , Layered architecture for VANETs, DSRC /WAVE standard (IEEE 802.11p ), IEEE 802.11p protocol Stack (PHY & MAC) , A Survey on Proposed MAC Approaches for VANETs like TDMA, SDMA and CDMA based approaches, DSRC MAC & LLC, Georouting: CBF, Flooding with broadcast suppression, Delay Tolerant Network, Introduction to Opportunistic Networking in Delay Tolerant Vehicular Ad Hoc Networks. | 10 | L1, L2, L3 |
| | **Total Hours** | **52** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Ad hoc Wireless Networks Architectures and protocols | Siva Ram Murthy and B.S. Manoj | Pearson Education | Second Edition | 2007 |
| 2 | Adhoc Mobile Wireless Networks | C. K. Toh | Pearson Education | -- | 2002 |
| 3 | Adhoc Networking | Charles E. Perkins | Addison – Wesley | -- | 2000 |
| 4 | Emerging Wireless Technologies and the Future Mobile Internet | Dipankar Raychaudhuri, Mario Gerla | Cambridge | -- | -- |
| 5 | Ad-Hoc Mobile Wireless Networks: principles, protocols and applications | Subir Kumar Sarkar | CRC Press | -- | -- |
| 6 | Ad Hoc Networks: Technologies and Protocols | Prasant Mohapatra and Sriramamurthy | Springer International Edition | -- | 2009 |
| 7 | Mobile Ad-Hoc Networking | Stefano Basangi, Marco Conti, Silvia Giordano, Ivan Stojmenovic | John-Wiley and Sons Publications | -- | 2004 |
| 8 | VANET Applications and Interworking Technologies | Hannes Hartenstein, Kenneth Laberteaux | Wiley Publications | -- | -- |
| 9 | Vehicular Networking | ChristophSommer , Falko Dressler | Cambridge University Press | -- | 2014 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.nptel.ac.in | https://nptel.ac.in/courses/106105160/ | M1-M4 |
| 2 | www.cs.jhu.edu | http://www.cs.jhu.edu/~cs647/ | M5 |
| 3 | www.sciencedirect.com | https://www.sciencedirect.com/topics/computer-science/vehicular-ad-hoc-network | M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Installation of NS2 & NS3 in Fedora 19 (32 bit) OS Linux | 2 | L1, L2 |
| 2 | | Simulating IEEE 802.11 wireless LAN in Ad-Hoc Mode using NS2 | 2 | L1, L2, L3 |
| 3 | **Design Experiments** | plementation a Bluetooth network in NS3 with application as transfer of a file from one device to another | 2 | L1, L2, L3, L4, L5,L6 |

| | | | | |
|---|---|---|---|---|
| 4 | | implement and compare MAC layer protocols, MACAW, MACA-BI and MACA with piggybacked Reservation using NS-3 | 2 | L1, L2, L3, L4, L5,L6 |
| 5 | | Develop sample wireless network in which<br>a. implement AODV and AOMDV protocol<br>b. Calculate the time to receive reply from the receiver using NS2.<br>c. Generate graphs which show the transmission time for packet. Implement wireless network. Capture data frame and identify fields using NS2. | 2 | L1, L2, L3, L4, L5,L6 |
| 6 | | Communicate between two different networks (NS-3) which has following specifications:<br>a. One network has Class A network with ―TORA protocol<br>b. Second has Class B network ―AODV protocol‖ | 2 | L1, L2, L3 |
| 7 | | To calculate and compare average throughput for various TCP variants like TCP-F (Feedback) and Ad-Hoc TCP using NS-3 | 4 | L1, L2, L3, L4 |
| 8 | | Explore and use security tools like WEP & WPA and evaluate its performance on mobile terminals | 4 | L1, L2, L3 |
| 9 | | Simulation of Urban Mobility (SUMO) along with MOVE for simulating the VANETs. Install it on Fedora 19 (32 bit) OS Linux | 4 | L1, L2, L3 |
| 10 | **Mini/Minor Projects/ Seminar/ Case Studies** | **Case study:**<br>1. Self-Organizing Network Architectures and Protocols.<br>2. Analyzing the security attacks in Mobile Ad Hoc Networks.<br>3. Privacy Issues in VANETs.<br>**Mini Project:**<br>13. Defense Mechanism Against Stealthy Attack in Wire less Ad Hoc Network<br>14. Defense Mechanism Against Data Flooding Attacks<br>15. Selfish Node Detection<br>16. Selfish Node Detection<br>Intrusion Detection System in VANET | 6 | L1, L2, L3, L4, L5,L6 |
| | | **Total Hours** | **30** | |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="8">B.E. ( Computer Engineering )</td><td colspan="3">B.E. SEM : VIII</td></tr>
<tr><td colspan="8">Course Name: Institute Level Optional Course-II (Project Management)</td><td colspan="3">Course Code : ILO8021</td></tr>
<tr><td colspan="8">Teaching Scheme (Program Specific)</td><td colspan="3">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="8">Modes of Teaching / Learning / Weightage</td><td colspan="3">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>80</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Data Structure, Software Engineering</td></tr>
</table>

**Course Objective:** The objective of the course is to familiarize the students with the use of a structured methodology/approach for each and every unique project undertaken, including utilizing project management concepts, tools and techniques and appraise the students with the project management life cycle and make them knowledgeable about the various phases from project initiation through closure.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Apply selection criteria and select an appropriate project from different options | L1, L2, L3, L4 |
| 2 | Write work break down structure for a project and develop a schedule based on it | L1, L2, L3, L4 |
| 3 | Identify opportunities and threats to the project and decide an approach to deal with them strategically. | L1, L2, L3, L4 |
| 4 | Use Earned value technique and determine & predict status of the project. | L1, L2, L3, L4 |
| 5 | Compare and contrast various project execution, Monitoring and Controlling Projects, Project Contracting, Project Leadership and Ethics and Closing the Project | L1, L2, L3, L4 |
| 6 | Capture lessons learned during project phases and document them for future reference | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Project Management Foundation**<br>Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical) Project phases and stage gate process. Role of project manager, Negotiations and resolving conflicts, Project management in various organization structures, PM knowledge areas as per Project Management Institute (PMI). | 6 | L1, L2, L3, L4 |
| 2 | **Initiating Projects**<br>How to get a project started, Selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter; Project proposal. Effective project team, Stages of team development & growth (forming, storming, norming &performing), team dynamics | 6 | L1, L2, L3, L4 |
| 3 | **Project Planning and Scheduling**<br>Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT, CPM, GANTT chart, Introduction to Project Management Information System (PMIS). | 8 | L1, L2, L3, L4 |
| 4 | **Planning Projects**<br>Crashing project time, Resource loading and levelling, Goldratt's critical chain, Project Stakeholders and Communication plan Risk Management in projects: Risk management planning, Risk identification and risk register, Qualitative and quantitative risk assessment, Probability and impact matrix. Risk response strategies for positive and negative risks | 8 | L1, L2, L3, L4 |
| 5 | **Executing Projects, Monitoring and Controlling Projects & Project Contracting**<br>5.1 Executing Projects: Planning monitoring and controlling cycle, Information needs and reporting, engaging with all stakeholders of the projects, Team management, communication and project meetings<br>5.2 Monitoring and Controlling Projects: Earned Value Management techniques for measuring value of work completed; Using milestones for measurement; change requests and scope creep, Project audit.<br>5.3 Project Contracting : Project procurement management, contracting and outsourcing, | 10 | L1, L2, L3, L4 |
| 6 | **Project Leadership and Ethics & Closing the Project**<br>6.1 Project Leadership and Ethics: Introduction to project leadership, ethics in projects, Multicultural and virtual projects 6.2 Closing the Project: Customer acceptance; Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), Process of project termination, completing a final report; doing a lessons learned analysis; acknowledging successes and failures; Project management templates and other resources; Managing without authority; Areas of further study. | 7 | L1, L2 |
| | **Total Hours** | **45** | |

## Books and References:

| S.No | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Project Management Foundation: | Project Management: A managerial approach, Jack Meredith & Samuel Mantel. | Wiley India | Seventh Edition | 2009 |
| 2 | Initiating Projects & Project Planning and Scheduling | A Guide to the Project Management Body of Knowledge (PMBOK® Guide) | Project Management Institute PA, USA | Fifth Edition | -- |
| 3 | Planning Projects | Project Management, Gido Clements | Cengage Learning | -- | -- |
| 4 | Executing Projects, Monitoring and Controlling Projects & Project Contracting | Project Management, Gopalan Wiley India | Wiley India | -- | -- |
| 5 | Project Leadership and Ethics & Closing the Project | Project Management, Dennis Lock. | Gower Publishing England | Ninth Edition | -- |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | http://www.opentextbooks.org.hk | http://www.opentextbooks.org.hk/system/files/export/15/15694/pdf/Project_Management_15694.pdf | M1-M6 |
| 2 | https://www.nesacenter.org | https://www.nesacenter.org/uploaded/conferences/SEC/2014/handouts/Rick_Detwiler/15_Detwiler_Resources.pdf | M1-M3, M6 |
| 3 | http://www.edo.ca | http://www.edo.ca/downloads/project-management.pdf | M1,M4 |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VIII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Institute Level Optional Course-II (Finance Management) | | | | | | | **Course Code :** ILO8022 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | |
| 3 | - | - | 3 | 3 | 20 | 80 | - | - | **100** |
| **IA: In-Semester Assessment - Paper Duration – 1 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** | | | | | | | | | |

**Course Objectives:** The course intends to give an overview of Indian financial system, instruments and market along with basic concepts of value of money, returns and risks, corporate finance, working capital and its management. It also exhibit knowledge about sources of finance, capital structure, dividend policy.

**Course Outcomes: Upon completion of the course students will be able to:**

| Sr. No. | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy Levels |
|---|---|---|
| 1 | Understand Indian Financial System with respect to financial Instruments, financial markets and institutions | L1,L2 |
| 2 | Understand the concepts of Returns and risks along with time value of money | L1, L2,L3 |
| 3 | Understand Corporate Finance and perform financial ratio analysis | L1, L2,L3 |
| 4 | Importance of Capital Budgeting | L1,L2,L3,L4 |
| 5 | Identify Sources of Finance and capital structure | L1,L2,L3,L4 |
| 6 | Analyze the Dividend Policy concepts for financial decisions | L1,L2,L3,L4 |

**Detailed Syllabus:**

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Overview of Indian Financial System**<br>Characteristics, Components and Functions of Financial System.<br>**Financial Instruments:** Meaning, Characteristics and Classification of Basic Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills.<br>**Financial Markets:** Meaning, Characteristics and Classification of Financial Markets — Capital Market, Money Market and Foreign Currency Market | 06 | L1,L2 |

| | | | |
|---|---|---|---|
| | **Financial Institutions:** Meaning, Characteristics and Classification of Financial<br>Institutions — Commercial Banks, Investment-Merchant Banks and Stock Exchanges | | |
| 2 | **Concepts of Returns and Risks**<br>Measurement of Historical Returns and Expected<br>Returns of a Single Security and a Two-security Portfolio; Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio.<br>**Time Value of Money:** Future Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Present Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Continuous Compounding and Continuous Discounting | 06 | L1, L2,L3 |
| 3 | **Overview of Corporate Finance**<br>Objectives of Corporate Finance; Functions of<br>Corporate Finance—Investment Decision, Financing Decision, and Dividend Decision.<br>**Financial Ratio Analysis:** Overview of Financial Statements—Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis. | 09 | L1, L2,L3 |
| 4 | **Capital Budgeting**<br>Meaning and Importance of Capital Budgeting; Inputs for Capital<br>Budgeting Decisions; Investment Appraisal Criterion—Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value(NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR)<br>**Working Capital Management:** Concepts of Meaning Working Capital; Importance of Working Capital Management; Factors Affecting an Entity‘s Working Capital Needs;<br>Estimation of Working Capital Requirements; Management of Inventories;<br>Management of Receivables; and Management of Cash and Marketable Securities | 10 | L1,L2,L3,L4 |
| 5 | **Sources of Finance**<br>Long Term Sources—Equity, Debt, and Hybrids; Mezzanine Finance; Sources of Short Term Finance—Trade Credit, Bank Finance, Commercial Paper; Project Finance.<br>**Capital Structure:** Factors Affecting an Entity‘s Capital Structure; Overview of Capital Structure Theories and Approaches— Net Income Approach, Net Operating Income Approach; Traditional Approach, and Modigliani-Miller Approach. Relation between Capital Structure and Corporate Value; Concept of Optimal Capital Structure | 05 | L1,L2,L3, L4 |
| 6 | **Dividend Policy**<br>Meaning and Importance of Dividend Policy; Factors Affecting an<br>Entity‘s Dividend Decision; Overview of Dividend Policy Theories and Approaches—Gordon‘s Approach, Walter‘s Approach, and Modigliani-Miller Approach | 03 | L1, L2, L3,L4 |
| | **Total Hours** | **39** | |

## Books and References:

| S. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Fundamentals of Financial Management | Eugene F. Brigham and Joel F. Houston | Cengage Publications, New Delhi | 13th Edition | 2015 |
| 2 | Analysis for Financial Management | Robert C. Higgins | McGraw Hill Education | 10th Edition | 2013 |
| 3 | Indian Financial System | M. Y. Khan | McGraw Hill Education, New Delhi | 9th Edition | 2015 |
| 4 | Financial Management | I. M. Pandey | S. Chand (G/L) & Company Limited, New Delhi | 11th Edition | 2015 |

## Online References:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.splessons.com | https://www.splessons.com/lesson/indian-financial-system-overview/ | M1,M3 |
| 2 | finance.zacks.com | https://finance.zacks.com/concepts-return-investment-risk-3049.html | M2 |
| 3 | www.edupristine.com | https://www.edupristine.com/blog/capital-budgeting | M4 |
| 4 | efinancemanagement.com | https://efinancemanagement.com/sources-of-finance | M5 |
| 5 | www.businessmanagementideas.com | https://www.businessmanagementideas.com/financial-management/dividends/meaning-and-types-of-dividend-policy-financial-management/3968 | M6 |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VIII</td></tr>
<tr><td colspan="7">Course Name: Institute Level Optional Course-II (Entrepreneurship Development and Management)</td><td colspan="4">Course Code : ILO8023</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>80</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite:</td></tr>
</table>

**Course Objective:** The objective of the course is to acquaint with entrepreneurship and management of business, understand Indian environment for entrepreneurship and introduce the idea of EDP and MSME.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Interpret the concept of business plan and ownerships | L1, L2, L3,L4 |
| 2 | Interpret key regulations and legal aspects of entrepreneurship in India | L1, L2, L3,L4 |
| 3 | Interpret government policies for entrepreneurs | L1, L2, L3,L4 |
| 4 | Interpret Indian Environment for Entrepreneurship | L1, L2, L3,L4 |
| 5 | Interpret issues and problems for effective business | L1, L2, L3,L4 |
| 6 | Understand business cycle for small businesses | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Overview Of Entrepreneurship**<br>Definitions, Roles and Functions/Values of Entrepreneurship, History of Entrepreneurship Development, Role of Entrepreneurship in the National Economy, Functions of an Entrepreneur, Entrepreneurship and Forms of Business Ownership Role of Money and Capital Markets in Entrepreneurial Development: Contribution of Government Agencies in Sourcing information for Entrepreneurship. | 4 | L1, L2, L3,L4 |
| 2 | **Business Plans And Importance Of Capital To Entrepreneurship**<br>Preliminary and Marketing Plans, Management and Personnel, Start-up Costs and Financing as well as Projected Financial Statements, Legal Section, Insurance, Suppliers and Risks, Assumptions and Conclusion, Capital and its Importance to the Entrepreneur<br>Entrepreneurship And Business Development: Starting a New Business, Buying an Existing Business, New Product Development, Business Growth and the Entrepreneur Law and its Relevance to Business Operations | 9 | L1, L2, L3,L4 |
| 3 | **Entrepreneurship Development**<br>Women's Entrepreneurship Development, Social entrepreneurship-role and need, EDP cell, role of sustainability and sustainable development for SMEs, case studies, exercises | 5 | L1, L2, L3,L4 |
| 4 | **Indian Environment for Entrepreneurship**<br>Key regulations and legal aspects , MSMED Act 2006 and its implications, schemes and policies of the Ministry of MSME, role and responsibilities of various government organizations, departments, banks etc., Role of State governments in terms of infrastructure developments and support etc., Public private partnerships, National Skill development Mission, Credit Guarantee Fund, PMEGP, discussions, group exercises etc. | 8 | L1, L2, L3,L4 |
| 5 | **Effective Management of Business**<br>Issues and problems faced by micro and small enterprises and effective management of M and S enterprises (risk management, credit availability, technology innovation, supply chain management, linkage with large industries), exercises, e-Marketing | 8 | L1, L2, L3,L4 |
| 6 | **Achieving Success In The Small Business**<br>Stages of the small business life cycle, four types of firm-level growth strategies, Options – harvesting or closing small business Critical Success factors of small business | 5 | L1, L2 |
| | **Total Hours** | **39** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Entrepreneurship development- Small Business Enterprise | Poornima Charantimath | Pearson | Fifth Edition | 2005 |
| 2 | Entrepreneurship | Robert D Hisrich, Michael P Peters, Dean A Shapherd | McGraw Hill | Sixth Edition | 2005 |
| 3 | Entrepreneurship Development | Dr. TN Chhabra | Sun India Publications | Second Edition | 2011 |
| 4 | Small and Medium Enterprises in Global Perspective | Dr. CN Prasad | New century Publications | - | 2012 |
| 5 | Entrepreneurial development and management | Mr. Vasant Desai | Himalaya Publishing House | Sixth Edition | 2018 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1. | www.saylordotorg.github.io | https://saylordotorg.github.io/text_the-sustainable-business-case-book/s09-01-overview-of-entrepreneurship.html | M1 |
| 2. | www.toptal.com | https://www.toptal.com/finance/business-plan-consultants/importance-of-business-plan | M2-M3 |
| 3. | www.gatheringofangels.com | https://www.gatheringofangels.com/entrepreneur-business-plan/ | M4 |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="8">B.E. ( Computer Engineering )</td><td colspan="2">B.E. SEM : VIII</td></tr>
<tr><td colspan="8">Course Name: Institute Level Optional Course-II (Human Resource Management)</td><td colspan="2">Course Code : ILO8024</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="5">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="5">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>80</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Interpersonal, decision-making, organizational, leadership, and speaking skills</td></tr>
</table>

**Course Objective:** This course intends to introduce the students with basic concepts, techniques and practices, latest developments, trends & different aspects of human resource management. It also strives to acquaint the student with the importance of interpersonal & inter-group behavioral skills in an organizational setting required for future stable engineers, leaders and managers.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the concepts, aspects, techniques and practices of human resource management | L1, L2, L3 |
| 2 | Understand the Human resource management (HRM) processes, functions, changes and challenges in today's emerging organizational perspective. | L1, L2, L3 |
| 3 | Gain knowledge about Organizational structure and Design | L1, L2, L3 |
| 4 | Apply the knowledge Of Human Resource and Career Planning , training and development | L1, L2, L3, L4 |
| 5 | Analyze and apply the latest trends in HR, for Organizational Development. | L1, L2,L3, L4 |
| 6 | Understand and evaluate the role of different information systems and applications in HR. | L1, L2, L3, L4, L5 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to HR**<br>Human Resource Management- Concept, Scope and Importance, Interdisciplinary Approach Relationship with other Sciences, Competencies of HR Manager, HRM functions Human resource development (HRD): changing role of HRM – Human resource Planning, Technological change, Restructuring and rightsizing, Empowerment, TQM, Managing ethical issues. | 6 | L1, L2, L3 |
| 2 | **Organizational Behavior (OB)**<br>Introduction to OB Origin, Nature and Scope of Organizational Behaviour, Relevance to Organizational Effectiveness and Contemporary issues Personality: Meaning and Determinants of Personality, Personality development, Personality Types, Assessment of Personality Traits for Increasing Self Awareness Perception: Attitude and Value, Effect of perception on Individual Decision-making, Attitude and Behaviour Motivation: Theories of Motivation and their Applications for Behavioural Change (Maslow, Herzberg, McGregor); Group Behaviour and Group Dynamics: Work groups formal and informal groups and stages of group development, Team Effectiveness: High performing teams, Team Roles, cross functional and self-directed team. Case study | 8 | L1, L2, L3 |
| 3 | **Organizational Structure &Design**<br>Structure, size, technology, Environment of organization; Organizational Roles & conflicts: Concept of roles; role dynamics; role conflicts and stress. Leadership: Concepts and skills of leadership, Leadership and managerial roles, Leadership styles and contemporary issues in leadership. Power and Politics: Sources and uses of power; Politics at workplace, Tactics and strategies. | 7 | L1, L2,L3 |
| 4 | **Human resource Planning**<br>Recruitment and Selection process, Job-enrichment, Empowerment - Job-Satisfaction, employee morale Performance Appraisal Systems: Traditional & modern methods, Performance Counselling, Career Planning Training & Development: Identification of Training Needs, Training Methods. | 10 | L1, L2, L3, L4 |
| 5 | **Emerging Trends in HR**<br>Organizational development; Business Process Re-engineering (BPR), BPR as a tool for organizational development , managing processes & transformation in HR. Organizational Change, Culture, Environment Cross Cultural Leadership and Decision Making: Cross Cultural Communication and diversity at work, Causes of diversity, managing diversity with special reference to handicapped, women and ageing people, intra company cultural difference in employee motivation | 12 | L1, L2, L3, L4 |
| 6 | **Introduction to Non Deterministic algorithm**<br>HR & MIS: Need, purpose, objective and role of information system in HR, Applications in HRD in various industries (e.g. manufacturing R&D, Public Transport, Hospitals, Hotels and service industries Strategic HRM: Role of Strategic HRM in the modern business world, Concept of Strategy, Strategic Management Process, Approaches to Strategic Decision Making; Strategic Intent – Corporate Mission, Vision, Objectives and Goals Labor Laws & Industrial Relations: Evolution of IR, IR issues in organizations, Overview of Labor Laws in India; Industrial Disputes Act, Trade Unions Act, Shops and Establishments Act. | 9 | L1, L2, L3, L4, L5 |
| | **Total Hours** | **52** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Organizational Behavior | Stephen Robbins | Pearson Education | 16th Edition | 2013 |
| 2 | Human Resource Management | V. S. Rao | Excel publishing | 3rd Edition | 2010 |
| 3 | Human resource management: Text & cases | Aswathapa | McGraw Hill Education | 6th Edition | 2011 |
| 4 | Dynamics of Industrial Relations in India, | C. B. Mamoria and S V Gankar | Himalaya Publishing | 15th Edition | 2015 |
| 5 | Essentials of Human Resource management and Industrial relations, | P. Subba Rao | Himalaya Publishing | 5th Edition | 2013 |
| 6 | Management & Organizational Behavior | Laurie Mullins, | Pearson Publications | Latest Edition | 2016 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | Coursera | https://www.coursera.org/specializations/human-resource-management | M1, M5, M4 |
| 2 | Alison | https://alison.com/tag/human-resources | M1-M4 |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VIII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Institute Level Optional Course-II (Professional Ethics and Corporate Social Responsibility (CSR)) | | | | | | | **Course Code :** ILO8025 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **100** |
| 3 | - | - | 3 | 3 | 20 | 80 | - | - | |
| **IA: In-Semester Assessment - Paper Duration – 1 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** | | | | | | | | | |

**Course Objective:** The objective of the course is to understand professional ethics in business and to recognized corporate social responsibility.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand rights and duties of business | L1, L2 |
| 2 | Distinguish different aspects of corporate social responsibility | L1, L2, L3,L4 |
| 3 | Demonstrate professional ethics | L1, L2, L3,L4 |
| 4 | Understand legal aspects of corporate social responsibility | L1, L2 |
| 5 | Understand professional ethics and social responsibility | L1, L2 |
| 6 | Understand corporate Social Responsibility in Globalizing India | L1, L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Professional Ethics and Business**<br>The Nature of Business Ethics; Ethical Issues in Business; Moral Responsibility and Blame; Utilitarianism: Weighing Social Costs and Benefits; Rights and Duties of Business | 4 | L1, L2, L3,L4 |
| 2 | **Professional Ethics in the Marketplace and Environment**<br>Professional Ethics in the Marketplace: Perfect Competition; Monopoly Competition; Oligopolistic Competition; Oligopolies and Public Policy Professional Ethics and the Environment: Dimensions of Pollution and Resource Depletion; Ethics of Pollution Control; Ethics of Conserving Depletable Resources | 8 | L1, L2, L3,L4 |
| 3 | **Professional Ethics of Consumer Protection and Job Discrimination**<br>Markets and Consumer Protection; Contract View of Business Firm's<br>Duties to Consumers; Due Care Theory; Advertising Ethics; Consumer<br>Privacy Professional Ethics of Job Discrimination: Nature of Job | 6 | L1, L2, L3,L4 |

| | | | |
|---|---|---|---|
| | Discrimination; Extent of Discrimination; Reservation of Jobs. | | |
| 4 | **Introduction to Corporate Social Responsibility**<br>Potential Business Benefits—Triple bottom line, Human resources, Risk management, Supplier relations; Criticisms and concerns—Nature of business; Motives; Misdirection. Trajectory of Corporate Social Responsibility in India | 5 | L1, L2, L3,L4 |
| 5 | **Corporate Social Responsibility**<br>Articulation of Gandhian Trusteeship Corporate Social Responsibility and Small and Medium Enterprises (SMEs) in India, Corporate Social Responsibility and Public-Private Partnership (PPP) in India | 8 | L1, L2, L3,L4 |
| 6 | **Corporate Social Responsibility in Globalizing India**<br>Corporate Social Responsibility Voluntary Guidelines, 2009 issued by the Ministry of Corporate Affairs, Government of India, Legal Aspects of Corporate Social Responsibility—Companies Act, 2013. | 8 | L1, L2, L3,L4 |
| | **Total Hours** | **39** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Business Ethics: Texts and Cases from the Indian Perspective | Ananda Das Gupta | Springer | - | 2013 |
| 2 | Corporate Social Responsibility: Readings and Cases in a Global Context | Andrew Crane, Dirk Matten, Laura Spence | Routledge | - | 2007 |
| 3 | Business Ethics: Concepts and Cases | Manuel G. Velasquez | Pearson | Seventh Edition | 2011 |
| 4 | Corporate Social Responsibility in India | Bidyut Chakrabarty | Routledge | - | 2015 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1. | www.tutorialspoint.com | https://www.tutorialspoint.com/engineering_ethics/engineering_ethics_rights_of_engineers.htm | M1-M2 |
| 2. | www. shodhganga.inflibnet.ac.in | https://shodhganga.inflibnet.ac.in/bitstream/10603/150502/13/13_chapter%206.pdf | M3 |
| 3. | www.iosrjournals.org | http://www.iosrjournals.org/iosr-jbm/papers/vol2-issue4/F0244148.pdf?id=5514 | M6 |

| B.E. ( Computer Engineering ) | | | | | | | B.E. SEM : VIII | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name:** Institute Level Optional Course-II (Research Methodology | | | | | | | **Course Code :** ILO8026 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **100** |
| 3 | - | - | 3 | 3 | 20 | 80 | - | - | |
| **IA: In-Semester Assessment - Paper Duration – 1 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** | | | | | | | | | |

**Course Objective:** The objective of the course is to understand Research and Research Process, to acquaint students with identifying problems for research and develop research strategies and to familiarize students with the techniques of data collection, analysis of data and interpretation

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Prepare a preliminary research design for projects in their subject matter areas | L1, L2, L3,L4 |
| 2 | Accurately collect, analyze and report data | L1, L2, L3,L4 |
| 3 | Present complex data or situations clearly | L1, L2, L3,L4 |
| 4 | Review and analyze research findings | L1, L2, L3,L4 |
| 5 | Illustrate various formation of research problems | L1, L2, L3,L4 |
| 6 | Analyze various outcomes of research | L1, L2, L3,L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction and Basic Research Concepts**<br>Research – Definition, Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, Principle. Research methods vs Methodology, Need of Research in Business and Social Sciences, Objectives of Research, Issues and Problems in Research, Characteristics of Research: Systematic, Valid, Verifiable, Empirical and Critical | 9 | L1, L2, L3,L4 |
| 2 | **Types of Research**<br>Basic Research, Applied Research, Descriptive Research, Analytical Research, Empirical Research, Qualitative and Quantitative Approaches | 7 | L1, L2, L3,L4 |
| 3 | **Research Design and Sample Design**<br>Research Design – Meaning, Types and Significance, Sample Design – Meaning and Significance Essentials of a good sampling Stages in Sample Design Sampling methods/techniques Sampling Errors | 7 | L1, L2, L3,L4 |
| 4 | **Research Methodology** | 8 | L1, L2, L3,L4 |

| | | | |
|---|---|---|---|
| | Meaning of Research Methodology, Stages in Scientific Research Process: Identification and Selection of Research Problem, Formulation of Research Problem, Review of Literature, Formulation of Hypothesis, Formulation of research Design, Sample Design, Data Collection, Data Analysis, Hypothesis testing and Interpretation of Data, Preparation of Research Report | | |
| 5 | **Formulating Research Problem** | 4 | L1, L2, L3,L4 |
| | Considerations: Relevance, Interest, Data Availability, Choice of data, Analysis of data, Generalization and Interpretation of analysis | | |
| 6 | **Outcome of Research** | 4 | L1, L2, L3,L4 |
| | Preparation of the report on conclusion reached, Validity Testing & Ethical Issues, Suggestions and Recommendation | | |
| | **Total Hours** | **39** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Practical Research Methods | Dawson, Catherine | UBS Publishers Distributors | - | 2002 |
| 2 | Research Methodology-Methods and Techniques | Kothari, C.R | Wiley Eastern Limited | Second Edition | 1985 |
| 3 | Research Methodology-A Step-by-Step Guide for Beginners | Kumar, Ranjit | Pearson | Second Edition | 2005 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1. | www.ihmgwalior.net | http://www.ihmgwalior.net/pdf/research_methodology.pdf | M1-M5 |
| 2. | https://shodhganga.inflibnet.ac.in/ | https://shodhganga.inflibnet.ac.in/bitstream/10603/63521/11/11_chapter3.pdf | M3 |
| 3. | www.arcjournals.org | https://www.arcjournals.org/pdfs/ijhsse/v1-i8/8.pdf | M5 |

| B.E. ( Computer Engineering ) | | | | | | | B.E. SEM : VIII | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :** Institute Level Optional Course-II (IPR and Patenting) | | | | | | | **Course Code :** ILO8027 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **100** |
| 3 | - | - | 3 | 3 | 20 | 80 | - | - | |
| **IA: In-Semester Assessment - Paper Duration – 1 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** Research methodology and Patenting | | | | | | | | | |

**Course Objective:** The objective of the course is understand intellectual property rights protection system, promote the knowledge of Intellectual Property Laws of India as well as International treat procedures and get acquaintance with Patent search and patent filing procedure and applications.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand Intellectual Property assets | L1,L2 |
| 2 | Assist individuals and organizations in capacity building | L1,L2 |
| 3 | Understand the work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting | L1,L2 |
| 4 | Understand the basics of patenting, rights and infringement | L1,L2 |
| 5 | Understand the rules in various scenarios | L1,L2 |
| 6 | Understand the procedure to file a patent | L1,L2 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Intellectual Property Rights (IPR)**<br>Meaning of IPR, Different Category of IPR instruments - Patents, Trademarks, Copyrights, Industrial Designs, Plant variety protection, Geographical indications, Transfer of technology etc.<br>**Importance of IPR in Modern Global Economic Environment:**<br>Theories of IPR, Philosophical aspects of IPR laws, Need for IPR, IPR as an instrument of development | 5 | L1,L2 |
| 2 | **Enforcement of Intellectual Property Rights** | 7 | L1,L2 |

| | | | |
|---|---|---|---|
| | **Enforcement of Intellectual Property Rights:** Introduction, Magnitude of problem, Factors that create and sustain counterfeiting/piracy, International agreements, International organizations (e.g. WIPO, WTO) active in IPR enforcement<br>**Indian Scenario of IPR:** Introduction, History of IPR in India, Overview of IP laws in India, Indian IPR, Administrative Machinery, Major international treaties signed by India, Procedure for submitting patent and Enforcement of IPR at national level etc. | | |
| 3 | **Emerging Issues in IPR**<br>Challenges for IP in digital economy, e-commerce, human<br><br>genome, biodiversity and traditional knowledge etc. | 5 | L1, L2 |
| 4 | **Basics of Patents**<br>Definition of Patents, Conditions of patentability, Patentable and non-patentable inventions, Types of patent applications (e.g. Patent of addition etc), Process Patent and Product Patent, Precautions while patenting, Patent specification Patent claims, Disclosures and non-disclosures, Patent rights and infringement, Method of getting a patent | 7 | L1, L2 |
| 5 | **Patent Rules**<br>Indian patent act, European scenario, US scenario, Australia scenario, Japan scenario, Chinese scenario, Multilateral treaties where India is a member (TRIPS agreement, Paris convention etc.) | 8 | L1, L2 |
| 6 | **Procedure for Filing a Patent (National and International)**<br>**Procedure for Filing a Patent (National and International):** Legislation and Salient, Features, Patent Search, Drafting and Filing Patent Applications, Processing of patent, Patent Litigation, Patent Publication, Time frame and cost, Patent Licensing, Patent Infringement<br>**Patent databases:** Important websites, Searching international databases | 7 | L1, L2 |
| | **Total Hours** | **39** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | A Handbook on Laws Relating to Intellectual Property Rights in India | Rajkumar S. Adukia | - | - | 2007 |
| 2 | Patent system and related issues at a glance, | Keayla B K | National Working Group on<br><br>Patent Laws | - | |
| 3 | Intellectual Property Law in India | T Sengupta | Kluwer Law International | - | 2011 |
| 4 | Intellectual Property and Human Development: Current<br><br>Trends and Future Scenario | Tzen Wong and Graham Dutfield, | Cambridge University Press | - | 2010 |
| 5 | Intellectual Property: Patents, Copyrights, | Cornish, William Rodolph & Llewelyn, David. | Sweet & Maxwell | 7th Edition | 2010 |

| | | | | | |
|---|---|---|---|---|---|
| | Trade Marks and Allied Right | | | | |
| 6 | The enforcement of Intellactual Property Rights: A Case Book | Lous Harns, | WIPO | 3rd Edition | 2012 |
| 7 | Intellectual Property Rights | Prabhuddha Ganguli, | TMH | 1st Edition | 2012 |
| 8 | Intellectual Property Rights | . R Radha Krishnan & S Balasubramanian | Excel Books | 1st Edition | 2012 |
| 9 | Intellectual Property Rights | M Ashok Kumar and mohd Iqbal Ali | Serial Publications | 2nd Edition | 2011 |
| 10 | Fundamentals of IPR for Engineers | Kompal Bansal and Praishit Bansal | BS Publications | 1st Edition | 2012 |
| 11 | A Manual on Intellectual Property Rights | Entrepreneurship Development and IPR Unit | BITS Pilani | - | 2007 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.cs.cmu.edu | www.cs.cmu.edu › slides › lec_3 | M1 |
| 2 | https://www.geeksforgeeks.org | https://www.geeksforgeeks.org/interprocess-communication-in-distributed-systems/ | M2 |
| 3 | www.tutorialspoint.com | https://www.tutorialspoint.com › Distributed-Systems | M1-M6 |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VIII</td></tr>
<tr><td colspan="7">Course Name : Institute Level Optional Course-II (Digital Business Management)</td><td colspan="4">Course Code : ILO8028</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>80</td><td>-</td><td>-</td></tr>
<tr><td colspan="9">IA: In-Semester Assessment - Paper Duration – 1 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="9">Prerequisite: Database Management and Ecommerce</td></tr>
</table>

**Course Objective:** The objective of the course is to familiarize with digital business concept, acquaint with E-commerce and give insights into E-business and its strategies.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Identify drivers of digital business | L1,L2,L3 |
| 2 | Illustrate various approaches and techniques for E-business and management | L1,L2,L3,L4 |
| 3 | Prepare E-business plan and its application | L1,L2,L3,L4 |
| 4 | Illustrate various ecommerce threats and the encryption standard | L1,L2,L3,L4 |
| 5 | Implement various E-Business formulation strategies | L1,L2,L3,L4 |
| 6 | Identify a case study and present the business plan | L1,L2,L3,L4 |

## Detailed Syllabus:

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | **Introduction to Digital Business** | 9 | L1,L2,L3 |
| | **Introduction to Digital Business**<br>Introduction, Background and current status, E-market places, structures, mechanisms, economics and impacts<br>Difference between physical economy and digital economy,<br>**Drivers of digital business-** Big Data & Analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things (digitally intelligent machines/services) Opportunities and Challenges in Digital Business. | | |
| 2 | **Overview of E-Commerce** | 6 | L1,L2,L3,L4 |
| | **E-Commerce-** Meaning, Retailing in e-commerce-products and services, consumer behavior, market research and advertisement B2B-E-commerce-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business EC and Corporate portals Other E-C models and applications, innovative EC System-From E-government and learning to C2C, mobile commerce and pervasive computing EC Strategy and Implementation-EC strategy and global EC, Economics and Justification of EC, Using Affiliate marketing to promote your e-commerce business, Launching a successful online business and EC project, Legal, Ethics and Societal impacts of EC | | |
| 3 | **Digital Business Support services:** | 6 | L1, L2, L3, L4 |
| | **Digital Business Support services:** ERP as e –business backbone, knowledge Tope Apps, Information and referral system<br>**Application Development:** Building Digital business Applications and Infrastructure | | |
| 4 | **Managing E-Business** | 6 | L1, L2, L3, L4 |
| | **Managing E-Business**-Managing Knowledge, Management skills for e-business, Managing Risks in e –business Security Threats to e-business - Security Overview, Electronic Commerce Threats, Encryption, Cryptography, Public Key and Private Key Cryptography, Digital Signatures, Digital Certificates, Security Protocols over Public Networks: HTTP, SSL, Firewall as Security Control, Public Key Infrastructure (PKI) for Security, Prominent Cryptographic Applications | | |
| 5 | **E-Business Strategy** | 4 | L1, L2, L3, L4 |
| | **E-Business Strategy-**E-business Strategic formulation- Analysis of Company's Internal and external environment, Selection of strategy, E-business strategy into Action, challenges and E-Transition (Process of Digital Transformation) | | |
| 6 | **Materializing e-business: From Idea to Realization** | 8 | L1, L2, L3, L4 |
| | **Materializing e-business: From Idea to Realization-**Business plan preparation, **Case Studies and presentations** | | |
| | **Total Hours** | **39** | |

## Books and References:

| | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | A textbook on E-commerce | Er Arunrajan Mishra, Dr W K Sarwade | Neha Publishers & Distributors | - | 2011 |
| 2 | E-commerce from vision to fulfilment | Elias M. Awad | PHI-Restricted | - | 2002 |
| 3 | Digital Business and E-Commerce Management | Dave Chaffey | Pearson | 6th Ed | 2014 |
| 4 | Introduction to E-business-Management and Strategy | Colin Combe | ELSVIER | - | 2006 |
| 5 | Digital Business Concepts and Strategy, | Eloise Coupey | Pearson | 2nd Edition | - |
| 6 | Trend and Challenges in Digital Business Innovation | Vinocenzo Morabito | Springer | - | - |
| 7 | Digital Business Discourse | Erika Darics, Palgrave Macmillan | - | - | 2015 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.cs.cmu.edu | www.cs.cmu.edu › slides › lec_3 | M1 |
| 2 | https://www.geeksforgeeks.org | https://www.geeksforgeeks.org/interprocess-communication-in-distributed-systems/ | M2 |
| 3 | www.tutorialspoint.com | https://www.tutorialspoint.com › Distributed-Systems | M1-M6 |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

| **B.E. ( Computer Engineering )** | | | | | | | **B.E. SEM : VIII** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Name :** Institute Level Optional Course-II (Environmental Management) | | | | | | | **Course Code :** ILO8029 | | |
| **Teaching Scheme (Program Specific)** | | | | | **Examination Scheme (Formative/ Summative)** | | | | |
| **Modes of Teaching / Learning / Weightage** | | | | | **Modes of Continuous Assessment / Evaluation** | | | | |
| **Hours Per Week** | | | | | **Theory (100)** | | **Practical/Oral (25)** | **Term Work (25)** | **Total** |
| **Theory** | **Tutorial** | **Practical** | **Contact Hours** | **Credits** | **IA** | **ESE** | **PR/OR** | **TW** | **100** |
| 3 | - | - | 3 | 3 | 20 | 80 | - | - | |
| **IA: In-Semester Assessment - Paper Duration – 1 Hours**<br>**ESE: End Semester Examination - Paper Duration - 3 Hours**<br>**The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) | | | | | | | | | |
| **Prerequisite:** | | | | | | | | | |

**Course Objective:** The objective of the course is to understand and identify environmental issues relevant to India and global concerns, learn concepts of ecology and familiarize environment related legislations.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Understand the concept of environmental management | L1,L2 |
| 2 | Understand ecosystem and biodiversity | L1,L2 |
| 3 | Understand interdependence, food chain and limiting factors etc. | L1,L2 |
| 4 | Understand the scope of environment management | L1,L2 |
| 5 | Understand ISO-14000 and certification | L1,L2 |
| 6 | Understand environment related legislations | L1,L2 |

**Detailed Syllabus:**

| Module No. | Topics | Hrs. | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|---|
| 1 | Introduction and Definition of Environment: Significance of Environment<br>Management for contemporary managers, Career opportunities, Environmental<br>issues relevant to India, Sustainable Development, the Energy scenario | 10 | L1,L2,L3 |
| 2 | Global Environmental concerns : Global Warming, Acid Rain, Ozone Depletion,<br>Hazardous Wastes, Endangered life-species, Loss of Biodiversity, Industrial/Manmade disasters, Atomic/Biomedical hazards, etc. | 6 | L1,L2,L3,L4,L5, L6 |

| | | | |
|---|---|---|---|
| 3 | Concepts of Ecology: Ecosystems and interdependence between living organisms, habitats, limiting factors, carrying capacity, food chain, etc. | 5 | L1, L2, L3, L4,L5 |
| 4 | Scope of Environment Management, Role and functions of Government as a planning and regulating agency, Environment Quality Management and Corporate Environmental Responsibility | 10 | L1, L2, L3, L4 |
| 5 | Total Quality Environmental Management, ISO-14000, EMS certification. | 5 | L1, L2, L3, L4 |
| 6 | General overview of major legislations like Environment Protection Act, Air (P&CP) Act, Water (P & CP) Act, Wildlife Protection Act, Forest Act, Factories Act, etc. | 3 | L1, L2, L3, L4 |
| | **Total Hours** | **39** | |

## Books and References:

| Sr No, | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Environmental Management: Principles and Practice | C J Barrow, Routledge | Publishers London | - | 1999 |
| 2 | A Handbook of Environmental Management Edited | Jon C. Lovett and David G. Ockwell | EdwardElgar Publishing | - | - |
| 3 | Environmental Management, | V Ramachandra and Vijay Kulkarni | TERI Press | - | - |
| 4 | Indian Standard Environmental Management Systems | Requirements With Guidance For Use,Bureau Of Indian Standards, | - | - | February 2005 |
| 5 | Environmental Management: An Indian Perspective | S N Chary and Vinod Vyasulu | Maclillan India | - | ,2000 |
| 6 | Introduction to Environmental Management, Mary K Theodore and Louise Theodore, CRC Press Environment and Ecology | Majid Hussain | Access Publishing. | 3rd Ed. | 2015 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.cs.cmu.edu | www.cs.cmu.edu › slides › lec_3 | M1 |
| 2 | https://www.geeksforgeeks.org | https://www.geeksforgeeks.org/interprocess-communication-in-distributed-systems/ | M2 |
| 3 | www.tutorialspoint.com | https://www.tutorialspoint.com › Distributed-Systems | M1-M6 |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="4">B.E. SEM : VIII</td></tr>
<tr><td colspan="7">Course Name: Cloud Computing Lab</td><td colspan="4">Course Code : CSL801</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">75</td></tr>
<tr><td>-</td><td>-</td><td>4</td><td>4</td><td>2</td><td>-</td><td>-</td><td>25</td><td>50</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite: Cloud Computing, Computer Networks</td></tr>
</table>

**Course Objective:** The objective of the course is to study key concepts of virtualization, apply various deployment models such as private, public, hybrid and community, understand various service models such as IaaS and PaaS and understand Security and Privacy issues in cloud.

**Course Outcomes: Upon completion of the course students will be able to:**

| SN | Course Outcomes | Cognitive levels of attainment as per Bloom's Taxonomy |
|---|---|---|
| 1 | Adapt different types of virtualization and increase resource utilization. | L1, L2, L3, L4 |
| 2 | Build a private cloud using open source technologies. | L1, L2, L3 |
| 3 | Analyze security issues on cloud | L1, L2, L3, L4 |
| 4 | Develop real world web applications and deploy on commercial cloud. | L1, L2, L3, L4, L5 |
| 5 | Demonstrate various service models | L1, L2, L3, L4 |
| 6 | Analyze different features of cloud computing | L1, L2, L3, L4 |

**Books and References:**

| S. No. | Title | Authors | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1 | Enterprise Cloud Computing | Gautam Shroff | Cambridge | Third Edition | 2010 |
| 2 | Cloud Security | Ronald Krutz and Russell Dean Vines | Wiley | -- | 2010 |
| 3 | Getting Started with OwnCloud | Aditya Patawa | Packt Publishing Ltd, | -- | 2013 |

## Online Resources:

| S. No. | Website Name | URL | Modules Covered |
|---|---|---|---|
| 1 | www.guru99.com | https://www.guru99.com › cloud-computing-for-beginners<br><br>https://www.w3schools.in/cloud-computing/cloud-computing-architecture/ | M1,M2 |
| 2 | opensourceforu.com | https://opensourceforu.com/2018/02/build-cloud-storage-system-using-oss/ | M3,M4 |
| 3 | www.josso.org | www.josso.org › tutorials | M5, M6 |

## List of Practical/ Experiments:

| Practical Number | Type of Experiment | Practical/ Experiment Topic | Hrs. | RBT Levels |
|---|---|---|---|---|
| 1 | **Basic Experiments** | Understand Cloud Computing, Architecture and various types of Cloud Computing. | 2 | L1, L2 |
| 2 | | Illustrate virtualization in Cloud by Creating and running virtual machines on open source OS. | 2 | L1, L2 |
| 3 | | strate Infrastructure as a Service (IaaS) by installing OpenStack and use it as IaaS. | 2 | L1, L2 |
| 4 | **Design Experiments** | strate Storage as Service (SaaS) by installing and understanding the features of own Cloud as SaaS. | 2 | L1, L2, L3 |
| 5 | | Illustrate identity management by installing and using identity management feature of OpenStack. | 2 | L1, L2, L3 |
| 6 | | Build a program for web feed. | 2 | L1, L2, L3 |
| 7 | | Illustrate Single-Sing-On by installing and using JOSSO | 2 | L1, L2, L3 |
| 8 | | a) To implement securing servers in Cloud by installing and using security feature of own Cloud<br>b) To Implement User Management in Cloud by installing and using the Administrative features of own Cloud. | 4 | L1, L2, L3<br>L1, L2, L3 |
| 9 | **Case Studies** | **Case study:**<br>1. Amazon EC2<br>2. Microsoft Azure | 2 | L1, L2, L3 |
| 10 | **Mini Project** | **Mini Project and presentation**<br>1. University Campus Online Automation Using Cloud Computing<br>2. Cloud Based Student Information Chatbot Project<br>3. Cloud Based Bus Pass System<br>4. Cloud computing for Rural banking<br>5. E-Learning Platform using Cloud Computing<br>6. Cloud Based Online Blood Bank System<br>7. Intelligent rule-based phishing websites classification Based on URL Features | 10 | L1, L2, L3, L4, L5 |

| | | | | |
|---|---|---|---|---|
| | | 8. Cloud Based Local Train Ticketing System<br>9. eBug Tracker – Bug Tracking System Project<br>10. Cloud Based Attendance System | | |
| | **Total Hours** | | **40** | |

**B.E. Semester –VIII**

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- HSD 2020)**

<table>
<tr><td colspan="7">B.E. ( Computer Engineering )</td><td colspan="3">B.E. SEM : VIII</td></tr>
<tr><td colspan="7">Course Name: Major Project-II</td><td colspan="3">Course Code : CSP801</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="5">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="5">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>-</td><td>-</td><td>12</td><td>12</td><td>6</td><td>-</td><td>-</td><td>50</td><td>50</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1 Hours<br>ESE: End Semester Examination - Paper Duration - 3 Hours<br>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite:</td></tr>
</table>

**Course Objective:** The primary objective is to meet the milestone s formed in the overall project plan decided in Project - I. The idea presented in Project-I should be implemented in Project -II with results, conclusion and future work. The project will culminate in the production of a thesis by each individual student.

## Guidelines:

**Project Report Format:** At the end of semester a student need to prepare a project report should be prepared as per the guidelines issued by the University of Mumbai. Along with project report a CD containing: project documentation, Implementation code, required utilities, Software's and user Manuals need to be attached.

**Term Work:** Student has to submit weekly progress report to the internal guide and whereas internal guide has to keep track on the progress of the project and also has to maintain attendance report. This progress report can be used for awarding term work marks. In case of industry projects, visit by internal guide will be preferred to get the status of project.

Distribution of marks for term work shall be as follows:

a) Weekly Attendance on Project Day
b) Project work contributions as per objective
c) Project Report (Hard Bound)
d) Term End Presentation (Internal)
e) The final certification and acceptance of TW ensures the satisfactory performance on the above aspects.

**Oral & Practical:** Oral & Practical examination of Project- II should be conducted by Internal and External examiners approved by University of Mumbai. Students have to give presentation and demonstration on the Project-II.

# APPENDIX

# Term work for Internship

**(Reference AICTE Internship Policy: Guidelines and Procedures)**

AICTE Internship Policy is flexible on the INTERNSHIP duration and prescribes a minimum of 14-20 credits of Internship/ Entrepreneurial activities / Project work/ Seminar and Inter/ Intra Institutional Training may be counted toward B. E. degree programme. One credit is equivalent to minimum 40-45 hours of work. Therefore, a full-time intern is expected to spend 40 - 45 hours per week on Internship, Training, Project work, Seminar activities etc. The total internship duration for the B.E. Programme being 600-800 hours. The flexibility of carrying out the internship based on availability of opportunities as specified by AICTE allows students to complete the requirements of internship credits over the entire duration of the B. E. Programme. The Term work for INTERNSHIP will not lead to non-grant of term. Term work for INTERNSHIP shall be in the form of report.

The academic council of the institute on 10th Sept. 2020 has approved the following internship scheme in adherence to the guidelines of AICTE

- INTERNSHIP is mandatory for all UG programmes, otherwise students will not be eligible for the degree.
- One credit of INTERNSHIP is equivalent to 40-45 hrs of engagement and therefore the institute can go for 40 hrs per credit. Students admitted at Second Year of B. E. (SE) degree through lateral entry, required to complete the credits applicable from second year onwards of the course.
- To get the required credit, 640-800 hrs of industry-oriented training to be completed over the duration of four years. In no case it should be less than 600 hrs which is the minimum requirements as per AICTE guideline. For lateral entry at SE, it will be in proportionate with credit.
- Year wise distribution of numbers of hours and equivalent credits are shown in the scheme of the B. E programme.
- Scope of internship will be as per the perspective of various activities stated in the AICTE guidelines.
- INTERNSHIP in case of TCET will be In-house or Out-house and also Online or in face to face mode.
- Online INTERNSHIP students can pursue during the semester but it should not impact the semester attendance and academics
- In case of in-house INTERNSHIP students will be encouraged to supplement the training with some online certification in the related subjects.
- INTERNSHIP credit hours can be accumulated over the years and the credit can be given in only May examinations.
- Proper balance between in-house and outhouse INTERNSHIP needs to be balanced so that all students shall complete in time and become eligible for the award of degree as per the requirement of AICTE guidelines.

**Term-work Evaluation:** Evaluation of the Term work will be based on presentation and report. The criteria of evaluation will take into account:

- Quality of content presented
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analysed along with the Internship Report.

# Major or additional Minor Degree through Specialization

- A student will be eligible to get Under Graduate degree with Honours or additional Minor Engineering, if he/she completes an additional 20 credits. These could be acquired through MOOCs.
- TCET will offer honour degree for major specialization.
- Every department has offered two specializations. Here we will form groups of the departments such that students from any of these groups will take any specialization of department within that group will have major degree and specialization of department belongs to another group will get minor degree.

  E.g. **Group -1:** comprises of COMP, IT, ELEX, E&TC

  **Group-2:** Mechanical

  **Group-3:** Civil

  Student of Electronics if takes specialization of IT as both the branch are of the same group student will get major degree and if the student from Civil branch is taking specialization from the COMP department (other group) then he/she will be offered minor degree.
- The list of specialization courses offered by various department are as follows:

| Sr. No. | Name of the Department | Specialization Courses offered by the Department |
|---|---|---|
| 1 | Information Technology(IT) | 1. Block chain<br>2. Infrastructure Security |
| 2 | Computer Engineering(COMP) | 1. Artificial Intelligence<br>2. Data Science |
| 3 | Electronics & Telecommunication(E&TC) | 1. IoT<br>2. Communication Networks towards 5G |
| 4 | Electronics(ELEX) | 1. IoT<br>2. Robotics<br>3. Sensor Technology |
| 5 | Mechanical(MECH) | 1. Energy Engineering<br>2. 3 D Printing |
| 6 | Civil(CIVIL) | 1. Infrastructure Engineering<br>2. Green Technology and Sustainability |