

School of Engineering

Bachelor of Technology Degree

Program Regulations and Curriculum 2020-2024

B. Tech. Computer Science and Technology

2020-2024

Regulations No: PU/AC-20.3/SOCSE01/CSG/2020-24 Resolution No. 3 of the 20th Meeting of the Academic Council held on 15th February, 2023, and Ratified by the Board of Management in its 21st Meeting held on, 22nd February, 2023.

February-2023

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PU/AC-20.3/SOCSE01/CSG/2020-2024

Bachelor of Technology Degree Program Regulations and Curriculum 2020-2024

In exercise of the powers conferred by and in discharge of duties assigned under the relevant provision(s) of the Act, Statutes and Academic Regulations, 2019, of the University, the Academic Council hereby makes the following Regulations, namely;

Preliminary:

Short Title and Commencement

- (a) These Regulations shall be called the **Bachelor of Technology Degree Program Regulations and Curriculum 2020-2024**.
- (b) These Regulations are subject to, and, pursuant to the Academic Regulations, 2019.
- (c) These Regulations shall be applicable to the ongoing Bachelor of Technology Degree Programs of the 2020-2024 batch and to all other Bachelor of Technology Degree Programs which may be introduced in future.
- (d) These Regulations shall supersede all the earlier Bachelor of Technology Degree Program Regulations and Curriculum, along with all the amendments thereto.
- (e) These Regulations shall come into force from the academic year 2020-2021.

Definitions:

In these Regulations, unless the context otherwise requires:

- a) "Academic Council" means the Academic Council of the University;
- b) "Academic Regulations" means the Academic Regulations, 2019, of the University;
- c) "Academic Term" means a Semester or Summer Term;
- d) "Act" means the Presidency University Act, 2013;
- e) "Board of Examinations (BOE)" means the Board of Examinations of the University;
- f) "Board of Management (BOM)" means the Board of Management of the University;
- g) "CGPA" means Cumulative Grade Point Average as defined in the Academic Regulations, 2019;
- *h) "Clause" means the duly numbered Clause, with Sub-Clauses included, if any, of these Regulations;*
- *i)* "Course" means, a specific subject usually identified by its Course Code and Course Name, with specified Credit Structure and Credits, Course Description/Content/Syllabus, a set of textbooks/references, taught by assigned Course Instructor(s) to a specific class (group of students) during a specific Academic Term;
- *j)* "Course Instructor" means the faculty member who is the Teacher/Course Instructor for the concerned Course;
- *k) "DAC" means the Departmental Academic Committee;*
- *l) "Dean" means the Dean of the concerned School;*
- *m) "HOD" means the Head of the concerned Department;*
- n) "Parent Department" means the Department that offers the Degree Program that a

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student undergoes;

- *o) "Program" means the Bachelor of Technology (B. Tech.) Degree Program;*
- *p)* "Program Regulations" means the Bachelor of Technology Degree Program Regulations and Curriculum 2020-2024;
- *q)* "Registrar" means the Registrar of the University;
- *r)* "SGPA" means the Semester Grade Point Average as defined in the Academic Regulations, 2019;
- s) "School" means a constituent institution of the University established for monitoring, supervising and guiding, teaching, training and research activities in broadly related fields of studies;
- *t)* "Section" means the duly numbered Section, with Clauses included in that Section, of these Program Regulations;
- u) "Statutes" mean the Statutes of Presidency University;
- v) "Sub-Clause" means the duly numbered Sub-Clause of these Program Regulations;
- w) "Summer Term" means an additional Academic Term conducted during the summer break (typically in June-July) for a duration of about eight (08) calendar weeks, with a minimum of thirty (30) University teaching days, and,
- *x) "University" means Presidency University, Bengaluru;*

1. INTRODUCTION:

- 1.1. The Academic Regulations, 2019, are applicable to all existing Degree Programs of the University. The Academic Regulations, and any amendments made therein, shall also be applicable to new Degree and Diploma Programs that may be offered by the University in future.
- 1.2. The **Bachelor of Technology Degree Program Regulations and Curriculum 2020-2024** are subject to, and, pursuant to the Academic Regulations, 2019.
- 1.3. These Program Regulations shall be applicable to the following **Bachelor of Technology (B. Tech.) Degree Programs of 2020-2024:**
 - 1.3.1. Bachelor of Technology in Civil Engineering, abbreviated as B. Tech. (Civil Engineering);
 - 1.3.2. Bachelor of Technology in Computer Engineering, abbreviated as B. Tech. (Computer Engineering);
 - 1.3.3. Bachelor of Technology in Computer Science and Engineering, abbreviated as B. Tech. (Computer Science and Engineering);
 - 1.3.4. Bachelor of Technology in Information Science and Engineering, abbreviated as B. Tech. (Information Science and Engineering);
 - 1.3.5. Bachelor of Technology in Information Science and Technology, abbreviated as B. Tech. (Information Science and Technology);
 - 1.3.6. Bachelor of Technology in Computer Science and Technology, abbreviated as B. Tech. (Computer Science and Technology);

- 1.3.7. Bachelor of Technology in Electronics and Computer Engineering, abbreviated as B. Tech. (Electronics and Computer Engineering);
- 1.3.8. Bachelor of Technology in Computer Science and Engineering (Cyber Security), abbreviated as B. Tech. (Computer Science and Engineering-Cyber Security);
- 1.3.9. Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence and Machine Learning), abbreviated as B. Tech. (Computer Science and Engineering-Artificial Intelligence and Machine Learning);
- 1.3.10. Bachelor of Technology in Computer Science and Engineering (IoT), abbreviated as B. Tech. (Computer Science and Engineering-IoT);
- 1.3.11. Bachelor of Technology in Computer Science and Engineering (Block Chain), abbreviated as B. Tech. (Computer Science and Engineering-Block Chain);
- 1.3.12. Bachelor of Technology in Computer Science and Engineering (Data Science), abbreviated as B. Tech. (Computer Science and Engineering-Data Science);
- 1.3.13. Bachelor of Technology in Computer Science and Technology (DevOps), abbreviated as B. Tech. (Computer Science and Technology-DevOps);
- 1.3.14. Bachelor of Technology in Computer Science and Technology (Big Data), abbreviated as B. Tech. (Computer Science and Technology-Big Data);
- 1.3.15. Bachelor of Technology in Electronics and Communication Engineering, abbreviated as B. Tech. (Electronics and Communication Engineering);
- 1.3.16. Bachelor of Technology in Electrical and Electronics Engineering, abbreviated as B. Tech. (Electrical and Electronics Engineering);
- 1.3.17. Bachelor of Technology in Mechanical Engineering, abbreviated as B. Tech. (Mechanical Engineering); and,
- 1.3.18. Bachelor of Technology in Petroleum Engineering, abbreviated as B. Tech. (Petroleum Engineering).
- 1.4. These Program Regulations shall be applicable to other similar programs, which may be introduced in future.
- These Program Regulations may evolve and get amended or modified or changed through 1.5. appropriate approvals from the Academic Council, from time to time, and shall be binding on all concerned.
- The effect of periodic amendments or changes in the Program Regulations, on the students 1.6. admitted in earlier years, shall be dealt with appropriately and carefully, so as to ensure that those students are not subjected to any unfair situation whatsoever, although they are required to conform to these revised Program Regulations, without any undue favour or considerations. anne
- 1.7. These Program Regulations are structured as follows:
 - 1.7.1. **Part A:** Specific regulations relevant to the Bachelor of Technology (B. Tech.) Degree Programs in pursuant of the provisions in Section 6.0 of the Academic Regulations, 2019, of the University.

1.7.2. **Part B:** Program Curriculum for the specific ongoing Bachelor of Technology (B. Tech.) Degree Program of study as enumerated and named in Clause 1.3.



2. PART A: PROGRAM REGULATIONS

2.1. Program Description and Duration

B. Tech. Degree Programs are offered in the following branches/disciplines by the respective Parent Departments as indicated in Table 2.1.

	Table 2.1 B. Tech. Degree Programs and Respective Parent Departments								
<i>S. No</i> .	B. Tech. Program (Branch/Discipline)	Parent Department							
1	B. Tech. (Civil Engineering)	Department of Civil Engineering							
2	B. Tech. (Computer Engineering)								
3	B. Tech. (Computer Science and Engineering)								
4	B. Tech. (Information Science and Engineering)								
5	B. Tech. (Information Science and Technology)								
<mark>6</mark>	B. Tech. (Computer Science and Technology)								
7	B. Tech. (Electronics and Computer Engineering)	Department of Computer Science and Engineering							
8	B. Tech. (Computer Science and Engineering-Cyber Security)								
9	B. Tech. (Computer Science and Engineering-Artificial Intelligence and Machine Learning)								
10	B. Tech. (Computer Science and Engineering-IoT)	Janu							
11	B. Tech. (Computer Science and Engineering-Block Chain)	REGISTRAR							

	Table 2.1 B. Tech. Degree Programs and Respective Parent Departments									
<i>S. No</i> .	B. Tech. Program (Branch/Discipline)	Parent Department								
12	B. Tech. (Computer Science and Engineering-Data Science)									
13	B. Tech. (Computer Science and Technology-DevOps)									
14	B. Tech. (Computer Science and Technology-Big Data)									
15	B. Tech. (Electronics and Communication Engineering)	Department of Electronics and Communication Engineering								
16	B. Tech. (Electrical and Electronics Engineering)	Department of Electrical and Electronics Engineering								
17	B. Tech. (Mechanical Engineering)	Department of Mechanical Engineering								
18	B. Tech. (Petroleum Engineering)	Department of Petroleum Engineering								

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The Bachelor of Technology Degree Program is a four-year, full-time, Semester based Program. The minimum duration of the B. Tech. Program is four (04) years and each year comprises of two academic Semesters (Odd and Even Semesters) and, hence, the duration of the B. Tech. Program is eight (08) Semesters.

2.2. Admission Criteria to the Four-Year Bachelor of Technology (B. Tech.) Degree Programs:

The University admissions shall be open to all persons irrespective of caste, class, creed, gender or nation. All admissions shall be made on the basis of merit in the qualifying examinations; provided that forty percent of the admissions in all Programs of the University shall be reserved for the students of Karnataka State and admissions shall be made through a Common Entrance Examination conducted by the State Government or its agency and seats shall be allotted as per the merit and reservation policy of the State Government from time to time.

The admission criteria to the B. Tech Programs are listed in the following Sub-Clauses:

- 2.2.1. An applicant who has successfully completed the Pre-University course or Senior Secondary School Course (+2) or equivalent such as (11+1), 'A' level in Senior School Leaving Certificate Course from a recognised university of India or outside or from Senior Secondary Board or equivalent, constituted or recognised by the Union or by the State Government of that Country for the purpose of issue of qualifying certificate on successful completion of the course, may apply for and be admitted into the course.
- 2.2.2. Provided further, the applicant must have taken Physics and Mathematics as compulsory subjects in the Pre-University/Higher Secondary/(10+2)/(11+1) examination, along with either Chemistry/Biology/Electronics/Computer Science/Biotechnology subject, and, the applicant must have obtained a minimum of 45% of the total marks (40% in case of candidates belonging to the Reserved Category as classified by the Government of Karnataka) in these subjects taken together.
- 2.2.3. The applicant must have appeared for the Joint Entrance Examinations (JEE) Main/JEE (Advanced)/Karnataka CET/COMED-K, or any other State-level Engineering Entrance Examinations.
- 2.2.4. Reservation for the SC/ST and other backward classes shall be made in accordance with the directives issued by the Government of Karnataka from time to time.
- 2.2.5. Admissions are offered to Foreign Nationals and Indians living abroad in accordance with the rules applicable for such admissions, issued from time to time by the Government of India.
- 2.2.6. Candidates must fulfil the medical standards required for admission as prescribed by the University.
- 2.2.7. If, at any time after admission, it is found that a candidate had not in fact fulfilled all the requirements stipulated in the offer of admission, in any form whatsoever, including possible misinformation and any other falsification, the Registrar shall report the matter to the Board of Management (BOM), recommending revoking the admission of the candidate.
- 2.2.8. The decision of the BOM regarding the admissions is final and binding.

2.3. Lateral Entry

The University admits students directly to the second year (3rd Semester) of the B. Tech. Degree Program as per the provisions and/or regulations of the Government of Karnataka pertaining to the "Lateral Entry" scheme announced by the Government from time to time.

Further, the general conditions and rules governing the provision of Lateral Entry to the B. Tech. Program of the University are listed in the following Sub-Clauses:

- 2.3.1. Admission to the 2nd year (3rd Semester) of the B.Tech Degree program shall be open to the candidates who are holders of a 3-year Diploma in Engineering (or equivalent qualification as recognised by the University), who have secured not less than forty-five percent (45%) marks in the final year examination (fifth and sixth Semesters of the Diploma Program) in the appropriate branch of Engineering. Provided that, in case of SC/ST and OBC candidates from Karnataka the minimum marks for eligibility shall be forty percent (40%).
- 2.3.2. Provided further that candidates seeking Lateral Entry may be required to complete specified Bridge Courses as prescribed by the University. Such Bridge Courses, if any, shall not be included in the CGPA computations.
- 2.3.3. All the existing Regulations and Policies of the University shall be binding on all the students admitted to the Program through the provision of Lateral Entry.
- 2.3.4. The Course requirements prescribed for the 1st Year of the B. Tech. Program shall be waived for the student(s) admitted through Lateral Entry and the duration of the B. Tech. Program for such students is three (03) years, commencing from the 3rd Semester (commencement of the 2nd Year) of the B. Tech. Program and culminating with the 8th Semester (end of the 4th Year) of the B. Tech. Program.
- 2.3.5. The existing Program Regulations of the concerned Program to which the student is admitted through the provision of Lateral Entry shall be binding on the student with effect from the 3rd Semester of the Program, i. e., the Program Structure and Curriculum from the 3rd to 8th Semesters of the Program concerned shall be binding on the student admitted through Lateral Entry. Further, any revisions/amendments made to the Program Regulations thereafter shall be binding on all the students of the concerned Program.
- 2.3.6. All the Courses (and the corresponding number of Credits) prescribed for the 1st Year of the concerned B. Tech. Program shall be waived for the student(s) admitted to the concerned B. Tech. Program through Lateral Entry. Further, the *Minimum Credit Requirements* for the award of the B. Tech. Degree in the concerned Program shall be prescribed/calculated as follows:

The *Minimum Credit Requirements* for the award of the Bachelor of Technology (B. Tech.) Degree prescribed by the concerned Bachelor of Technology Degree Program Regulations and Curriculum 2020-2024, minus the number of Credits prescribed for the 1st Year (total number of Credits

prescribed for the 1st and 2nd Semesters) of the B. Tech. Program.

For instance, if the *Minimum Credit Requirements* for the award of the Bachelor of Technology (B. Tech.) Degree as prescribed by the Regulations for B. Tech. (Computer Science and Technology) is "N" Credits, and, if the total credits prescribed in the 1st Year (total credits of the 1st and 2nd Semesters) of the Program concerned is "M" Credits, then the *Minimum Credit Requirements* for the award of the B. Tech. Degree in Computer Science and Technology for a student who joins the Program through the provision of the Lateral Entry shall be "N – M" Credits.

2.3.7. Further, no other waiver except the Courses prescribed for the 1st year of the B. Tech. Program of the University shall be permissible for students joining the B. Tech. Program through the provision of Lateral Entry.

2.4. Transfer of student(s) from another recognized University to the 2nd year (3rd Semester) of the B. Tech. Program of the University

A student who has completed the 1st Year (i. e., passed in all the Courses/Subjects prescribed for the 1st Year) of the B. Tech/B. E./B. S., four-year Degree Program from another recognized University, may be permitted to transfer to the 2nd Year (3rd Semester) of the B. Tech. Program of the University as per the rules and guidelines prescribed in the following Sub-Clauses:

- 2.4.1. The concerned student fulfils the criteria specified in Sub-Clauses 2.3.1, 2.3.2 and 2.3.3.
- 2.4.2. The student shall submit the Application for Transfer along with a nonrefundable Application Fee (as prescribed by the University from time to time) to the University no later than July 10 of the concerned year for admission to the 2nd Year (3rd Semester) of the B. Tech. Program commencing on August 1 on the year concerned.
- 2.4.3. The student shall submit copies of the respective Marks Cards/Grade Sheets/Certificates along with the Application for Transfer.
- 2.4.4. The transfer may be provided on the condition that the Courses and Credits completed by the concerned student in the 1st Year of the B. Tech./B. E./B. S., four-year Degree Program from the concerned University, are declared equivalent and acceptable by a Committee constituted by the Vice Chancellor for this purpose. Further, the Committee may also prescribe the Courses and Credits the concerned students shall have to mandatorily complete, if admitted to the 2nd Year of the B. Tech. Program of the University.
- 2.4.5. The Branch/Discipline allotted to the student concerned shall be the decision of the University and binding on the student.

2.5. Change of Branch/Discipline

A student admitted to a particular Branch of the B. Tech. Program will normally continue shound in that Branch till the completion of the program. However, the University reserves the right to provide the option for a change of Branch, or not to provide the option for a change of Branch, at the end of the 1st Year of the B. Tech. Program to eligible students in accordance with the following rules and guidelines framed by the University from time to time.

- 2.5.1. Normally, only those students, who have passed all the Courses prescribed for the 1st Year of the B.Tech Program and obtained a CGPA of not less than 6.00 at the end of the 2nd Semester, shall be eligible for consideration for a change of Branch.
- 2.5.2. Change of Branch, if provided, shall be made effective from the commencement of the 3rd Semester of the B. Tech. Program. There shall be no provision for change of Branch thereafter under any circumstances whatsoever.
- 2.5.3. The student(s) provided with the change of Branch shall fully adhere to and comply with the Program Regulations of the concerned Branch of the B. Tech. Program, the Fee Policy pertaining to that Branch of the B. Tech. Program, and, all other rules pertaining to the changed Branch existing at the time.
- 2.5.4. Change of Branch once made shall be final and binding on the student. No student shall be permitted, under any circumstances, to refuse the change of Branch offered.
- 2.5.5. The eligible student may be allowed a change in Branch, strictly in order of *inter se* merit, subject to the conditions given below:
 - 2.5.5.1. The actual number of students in the third Semester in any particular Branch to which the transfer is to be made, should not exceed the intake fixed by the University for the concerned Branch; and,
 - 2.5.5.2. The actual number of students in any Branch from which transfer is being sought does not fall below 75% of the total intake fixed by the University for the concerned Branch.
- 2.5.6. The process of change of Branch shall be completed within the first five days of Registration for the 3rd Semester of the B. Tech. Program.

2.6. Professional Practice Courses

Professional Practice Courses (Professional Practice-I and Professional Practice-II) are practice based Courses with the objective to equip students with the skills of problem identification, root cause analysis and problem solving, innovation and design thinking through industry exposure and project based learning. The expected outcomes are first level proficiency in problem solving and design thinking skills to better equip B. Tech. graduates for their professional careers.

The method of evaluation and grading for the Professional Practice Courses shall be prescribed and approved by the concerned Departmental Academic Committee (refer Annexure A of the Academic Regulations, 2019). The same shall be prescribed in the Course Handout.

2.7. Professional Practice-I

Professional Practice–I is a 5-Credit Course. This first level practice based course is conducted after the 4th Semester of the B. Tech. Program, during the summer break (usually June-July), in accordance with the following options and guidelines:

2.7.1. Internship Program in an Industry/Company:

A student may undergo an Internship Program for a period of 6–8 weeks in an Industry/Company, subject to the following conditions.

- 2.7.1.1. The Internship Program shall be conducted in accordance with the Internship Policy prescribed by the University from time to time.
- 2.7.1.2. The selection criteria (minimum CGPA, pass in all Courses as on date,

and any other qualifying criteria) as applicable/stipulated by the concerned Industry/Company for award of the Internship to a student.

- 2.7.1.3. The number of Internships available for the concerned Academic Term: further, the available number of internships shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry/Company providing the Internship, as stated in Sub-Clause 2.7.1.2 above.
- 2.7.1.4. A student may opt for Internship in an Industry/Company of her/his choice, subject to the condition that the concerned student takes the responsibility to arrange the Internship on her/his own. Provided further, that the Industry/Company offering such Internship confirms to the University that the Internship program shall be conducted in accordance with the Program Regulations and Internship Policy of the University.
- 2.7.1.5. A student selected for an Internship in an Industry/Company shall adhere to all the rules and guidelines prescribed in the Internship Policy of the University.

2.7.2. Project Work:

A student may opt to do a Project Work in an Industry/Company/Research Laboratory or the University Department(s) subject to the following conditions:

- 2.7.2.1. The Project Work shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.
- 2.7.2.2. The student may do the project work in an Industry/Company/Research Laboratory of her/his choice subject to the above mentioned condition (Sub-Clause 2.7.2.1). Provided further, that the Industry/Company/Research Laboratory offering such project work confirms to the University that the project work will be conducted in accordance with the Program Regulations and requirements of the University.

2.8. Professional Practice–II

Professional Practice-II is an intensive practice based course with 15 Credits offered during the final (4th) year of the B. Tech. Program. Students may register for Professional Practice–II in the 8th Semester of the B. Tech. Program, in accordance with the following guidelines:

2.8.1. Internship Program in an Industry/Company:

A student may undergo an Internship Program for a period of about 15 years in an Industry/Company, subject to the following conditions:

2.8.1.1. The Internship Program shall be in conducted in accordance with the Internship Policy prescribed by the University from time to time.

- 2.8.1.2. The selection criteria (minimum CGPA, pass in all Courses as on date, any other qualifying criteria) as applicable/stipulated by the concerned Industry/Company for award of Internship to a student.
- 2.8.1.3. The number of Internships available for the concerned Academic Term: further, the available number of Internships will be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry/Company providing the Internship, as stated in Sub-Clause 2.8.1.2 above.
- 2.8.1.4. A student may opt for Internship in an Industry/Company of her/his choice, subject to the condition that the concerned student takes the responsibility to arrange the Internship on her/his own. Provided further, that the Industry/Company offering such Internship confirms to the University that the Internship program shall be conducted in accordance with the Program Regulations and Internship Policy of the University.
- 2.8.1.5. A student selected/awarded an Internship Program in an Industry/Company shall adhere to all the rules and guidelines prescribed in the Internship Policy of the University.

2.8.2. Project Work with a Dissertation:

A student may do an extensive Project Work (with a Dissertation) in an Industry/Company/Research Laboratory or the University Department(s), subject to the following conditions:

- 2.8.2.1. The Project Work shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.
- 2.8.2.2. The student may do the Project Work in an Industry/Company/Research Laboratory of her/his choice subject to the above mentioned condition (Sub-Clause 2.8.2.1). Provided further, that the Industry/Company/Research Laboratory offering such Project Work confirms to the University that the Project Work will be conducted in accordance with the Program Regulations and requirements of the University.

2.9. Social Immersion Courses

The objective of a Social Immersion Course (SIC) is to sensitize and inculcate commitment to social and environmental issues and make a contribution through service and experiential learning. The outcome is to produce graduates who are sensitized and committed to serving the social and environmental needs of society.

The SIC is a 1-Credit Course coordinated by the Parent Department or a group of Departments and the student is required to complete this course ideally during any of the Semesters of the 2^{nd} or 3^{rd} Year of the B. Tech. Program. The nature and details of the SIC shall be approved by the concerned Departmental Academic Committee (DAC). As per the Academic Regulations, the 'S' grade is awarded for "satisfactory completion" of the Course and the 'NC' grade is awarded for "non-completion" of the Course. The student who receives the 'NC' grade shall repeat the SIC (it may be another type of SIC as approved by the concerned DAC) until the concerned student secures the 'S' grade in the SIC. The 'S' and 'NC' grades do not carry grade points and, hence, are not included in the SGPA, CGPA computations.

2.10. Open Electives

Open Electives are Courses offered by any Department/School of the University. The primary objective of offering Open Electives is to provide interdisciplinary/transdisciplinary learning experiences. The outcome is a graduate with a fair exposure to disciplines beyond the chosen Branch in the B. Tech. Program.

Open Electives offered by any Department/School of the University are listed in the Course Structure under the Open Elective category and offered to students of any Department including the parent Department/School.

The Course details and method of evaluation shall be clearly prescribed in the concerned Course Handout.

2.11. Specific Regulations regarding Assessment and Evaluation

(Refer Sections 8.5 to 8.8 in the Academic Regulations, 2019)

The components of continuous assessments, weightage for each component and the method of evaluation shall be assigned considering the nature of the Courses in terms of the pedagogy and outcomes.

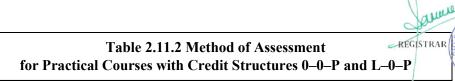
2.11.1. Normally, for the Courses that have only the Lecture and Tutorial or Lecture Credit Structure (L–T–0 or L–0–0), with no Practical component, the components of Continuous Assessment and the distribution of weightage

among the components of Continuous Assessment and duration of the examination/assessment shall be as detailed in Table 2.11.1 below:

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	Table 2.11.1 Method of Assessmentfor Courses with Credit Structures L–T–0 and L–0–0								
S. No.	Components of Continuous Assessment	Weightage (% of Total Marks)	Duration of Assessment						
1	Mid Term Examination	30%	1.5 hours						
2	Continuous Assessment: This component of Continuous Assessment shall consist of at least two (02) of the following: (1) Assignment(s), (2) Quiz, (3) Technical Seminar/Report, (4) Attendance/Class participation, (5) Assessment on the self-learning topic(s), or, (6) Any other type of assessment as prescribed in the concerned Course Handout.	20%	NA						
3	End Term Final Examination	50%	3 hours						
	Total	100%							
	Note: (i) An additional Test 3 may be con- allow for improvement with app Engineering. If a Test 3 is pro- obtained in any two tests shall be (ii) Normally, the End Term Final Ex- course coverage as prescribed in	proval of the De ovided, then the e considered for amination shall	ean, School of higher marks evaluation. cover the entire						

2.11.2. Normally, for Laboratory/Practice Based Courses with a Credit Structure of (0–0–P) or (L–0–P) the components of Continuous Assessment and the distribution of weightage among the components of Continuous Assessment and duration of the examination/assessment shall be as detailed in Table 2.11.2 that follows.



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S. No.	Components of Continuous Assessments	Weightage (% of Total Marks)	Duration of Assessment
1	Mid Term Examination: Laboratory Work/Practical exercises, conducted in every Laboratory/Practice session/activity, including Laboratory records, practice/project reports, attendance/class participation as applicable, and as prescribed by the Course Handout.	30%	NA
2	Continuous Assessment : Practical Test/Viva-Voce/Quiz/Practice Assignments/Presentations and other assessments as prescribed in the Course Handout.	20%	NA
3	End Term Practical Examination: Practical Experiment/Practice Test(s) with Viva-Voce, Jury or any other type of assessment as prescribed in the Course Handout.	50%	2 or 3 hours
	Total	100%	

- 2.11.3. Normally, for Practice/Skill based Courses, without a defined credit structure (L–T–P) but with assigned Credits (as defined in Clause 5.2 of the Academic Regulations, 2019), the method of evaluation shall be based only on Continuous Assessments. The various components of Continuous Assessments, the distribution of weightage among such components, and the method of evaluation/assessment, shall be prescribed in the concerned Course Handout. There shall be no component of End Term Final Examinations for such Courses.
- 2.11.4. In case any exception is required for a particular Course, where the methods of assessment prescribed in the specific regulations mentioned above in Sub-Clauses 2.11.1, 2.11.2 and 2.11.3 are not suitable/relevant for assessing the performance in the concerned Course, the DAC shall recommend the appropriate method of assessment for approval by the BOS.

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2.12. Course Handout

The Course Handout (Refer Clause 6.2 of the Academic Regulations, 2019) is a comprehensive document describing the Objectives/Outcomes of the Course, the detailed syllabus (with the prescribed Textbook(s) and Reference Material), the Lesson/Session-wise Plan, and all the relevant and necessary details regarding the pedagogy, expectation from the students regarding preparation, participation and self-learning, components of continuous assessment and respective weightage (in percentage (%) of the total marks of all components of assessment) given to the components, and the method of evaluation. The guidelines for preparation of the Course Handout, its approval and delivery are listed in the following Sub-Clauses:

- 2.12.1. The Course Handout will be prepared as per the Outcome Based Education Guidelines of the University.
- 2.12.2. Normally, the Course Handout is prepared by the Course Instructor(s) assigned to teach the Course. In cases of multiple sections of students registered for the same Course, an Instructor In-Charge, assigned by the DAC, shall prepare the Course Handout in consultation with the other Course Instructors assigned to the concerned Course.
- 2.12.3. The DAC shall examine each Course Handout and arrange for necessary deliberations as required. On acceptance of the completeness and quality of the Course Handout, the DAC shall approve the Course Handout.
- 2.12.4. A consolidated printed/soft copy of the Booklet of all Course Handouts corresponding to the concerned Semester of a particular Program of Study shall be provided to every student concerned on the first day/Registration day of the concerned Semester.
- 2.12.5. The Course Handout Booklet is a very important guide for the students registered in the concerned course. The students are expected to use the Course Handout Booklet to prepare regularly and benefit from each session (Lecture/Tutorial/Practical) of the Course(s) and perform well in the Continuous Assessments and End Term Final Examinations, as applicable. Every student shall read and adhere to all the guidelines prescribed in the Course Handout Booklet.

2.13. Rules and Guidelines for Transfer of Credits from Massive Open Online Courses

(Refer Section 18.0 of the Academic Regulations, 2019.)

The provisions and rules pertaining to the transfer of credits through Massive Open Online Courses are outlined in Section 18.0 of the Academic Regulations, 2019.

With reference to Clause 18.2 of the Academic Regulations, the rules and guidelines for transfer of credits specifically from Study Webs of Active-Learning for Young Aspiring Minds-National Program on Technology Enhanced Learning (SWAYAM-NPTEL) are as stated in the following Sub-Clauses:

2.13.1. A student may complete SWAYAM-NPTEL courses and transfer equivalent credits to partially or fully complete the mandatory credit requirements of Discipline Elective Courses and/or the mandatory credit requirements of Management Sciences Courses as prescribed in the concerned B. Tech. Program Regulations

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and Curriculum. However, it is the sole responsibility of the student to complete the mandatory credit requirements of the Discipline Elective Courses, the Open Elective Courses and the Management Sciences Courses as prescribed by the Program Regulations and Curriculum of the concerned B. Tech. Program.

- 2.13.2. Approved SWAYAM-NPTEL Courses shall be included as annexes to the Program Regulations and Curriculum for the concerned B. Tech. Program and shall be announced through University Notifications to the students from time to time. A student shall only request for transfer of credits from such approved/notified SWAYAM-NPTEL Courses as published by the concerned Departments.
- 2.13.3. SWAYAM-NPTEL Courses are considered for transfer of credits only if the concerned student has successfully completed the SWAYAM-NPTEL Course(s) and obtained the SWAYAM-NPTEL Certificate to this effect.
- 2.13.4. A student cannot transfer credits from SWAYAM-NPTEL Courses to earn the mandatory credits assigned for any other type of Courses (other than Discipline, Open Elective Courses and Management Sciences Courses) as prescribed in the concerned Program Regulations and Curriculum. However, a student may complete SWAYAM-NPTEL Courses and transfer equivalent credits in excess of the required mandatory Credits (and Courses). In the case of such transfers beyond the mandatory Credits the transferred Credits will be included in the calculations of SGPA and CGPA.
- 2.13.5. Before the commencement of each Semester or during Pre-Registration schedule as per the Academic Calendar, Parent Departments may release a list of SWAYAM-NPTEL courses approved as Discipline Elective courses for each B. Tech. Program offered by them. In addition, Departments may also release a list of Open Elective courses offered for all B. Tech. Programs.
- 2.13.6. Students may Pre-Register for the approved SWAYAM-NPTEL Courses in the respective Departments and register for the SWAYAM-NPTEL Courses as per the schedule announced by SWAYAM-NPTEL.
- 2.13.7. The credit equivalence of the SWAYAM-NPTEL Courses are based on course durations and/or as recommended by SWAYAM-NPTEL. The Credit Equivalence mapped to SWAYAM-NPTEL course durations for transfer of credits is summarised in Table 2.13.1 below.

Table	Table 2.13.1 SWAYAM-NPTEL Course Durations and Credit Equivalence							
S. No.	Course Duration	Credit Equivalence for Transfer of Credits						
1	4 Weeks	1 Credit						
2	8 Weeks	2 Credits						
3	12 Weeks	3 Credits						

2.13.8. A student who has successfully completed the approved SWAYAM-NPTEL Course(s) and wants to avail the provision of transfer of equivalent credits to fulfil (partially or fully) the mandatory credit requirements of the Discipline Electives and/or Open Electives and/or Management Sciences Courses as prescribed in the concerned Program Regulations and Curriculum, must submit the original SWAYAM-NPTEL Course Certificates to the Head of the Parent Department concerned, with a written request for the transfer of the equivalent credits. On verification of the SWAYAM-NPTEL Course Certificates and approval by the Head of the Department concerned, the SWAYAM-NPTEL Course(s) and equivalent Credits will be included in Course (with associated Credits) Registration of the SWAYAM-NPTEL Course(s).

2.13.9.	The grading system	for such	SWAYAM-NPTEL	Courses	with	transfer	of
	credits is specified in	Table 2.1	13.2 below.				

	Table 2.13.2 Grading System for SWAYAM-NPTEL Courses									
S. No.	Final Score on the SWAYAM-NPTEL Certificate	Grade Awarded								
1	90% and above	0								
2	From 80% to 89%	A+								
3	From 70% to 79%	А								
4	From 60% to 69%	B+								
5	From 50% to 59%	В								
6	From 40% to 49%	С								

- 2.13.10.A student may submit a request for credit transfer from SWAYAM-NPTEL Courses before the last instruction day of the seventh (7th) Semester of the B. Tech. program as specified in the Academic Calendar. Requests for credit transfers shall not be permissible in the eighth (8th) semester.
- 2.13.11. The maximum permissible number of credits that a student may request for transfer in a Semester is ten (10) credits.
- 2.13.12.The University shall not reimburse any fees/expense, a student may incur for the SWAYAM-NPTEL Courses.

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3 PART B: PROGRAM CURRICULUM

BACHELOR OF TECHNOLOGY DEGREE PROGRAM IN COMPUTER SCIENCE ANDENGINEERING B.TECH (COMPUTER SCIENCE AND TECHNOLOGY) 2020-2024

B.Tech in Computer Science and Technology is a program that is offered by the Department of CSE, SOE. The faculty work with motivation and dedication to impart the best knowledge to the budding thoughts admitted in our department. A wide range of courses is offered to students to help them in the understanding of the various intricacies involved in computing. The courses are designed in a way to invoke students' ability to think originally and creatively. The faculty members of CS department are trained to produce computer engineers with the ability to design and develop systems involving the integration of software and hardware devices. The department is equipped with modern computer labs with well-trained lab assistants to empower students with a better understanding of the theory lecture sessions and to give them an exposure to practical problem solving.

The program will also prepare students for postgraduate studies and helps in cracking different national and international aptitude tests for getting admission to IITs, NITs as well as different top ranked Universities in countries like USA, Australia, Singapore and Europe. The students are encouraged to take online courses, from SWAYAM, NPTEL at national level and MOOCs from Harvard, MIT, Microsoft and other top universities and institutions across the World. The program also includes value added courses like SIC and NSS activities that help the students to build moral and ethical standards and also to inherit qualities such as integrity, transparency, respect, professionalism and teamwork.

The Program Educational Objectives, Program Outcomes, Program Specific Outcomes and Learning Objectives of the B.Tech. Program in Computer Science and Technology at Presidency University are as follows.

Program Educational Objectives (PEO)

After the completion of B.Tech. Program in Computer Science and Technology from Presidency University, the graduates shall:

PEO 01 : Demonstrate as a Communication Engineering Professional

PEO 02 : A Teaching and Research Professional in the area of Communication Engineering through lifelong learning.

PEO 03 : A Consultancy team member in the Computer communication Engineering Industry.

PEO 04 : An entrepreneur in the Communication Engineering specialization.

Program Outcomes (PO)

Graduates of the B. Tech. Program in Computer Science and Technology will acquire:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics; natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: 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.

Program Specific Outcomes (PSO)

At the end of the B. Tech. Program in Computer Science and Technology the students shall:

PSO 01 : [Problem Analysis]: Identify, formulate, research literature, and analyze complex engineering problems related to Software Engineering principles and practices, Programming, Artificial Intelligence and Machine Learning algorithms reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PSO 02: [**Design/development of Solutions]:** Design solutions for complex engineering problems related to Software Engineering principles and practices, Programming, Artificial Intelligence and Machine Learning algorithms and design system components or processes that meet t h e specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PSO 03 : [Modern Tool usage] : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering

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activities related to Software Engineering principles and practices, Programming, Artificial Intelligence and Machine Learning algorithms with an understanding of the limitations

Learning Outcome (LO)

LO1: To gain recognition as a Department of Excellence.

LO2: To provide opportunity to students to excel in curricular, extra-curricular and co-curricular activities.

LO3: To provide students an environment of innovation and train students to pursue research.

LO4: To equip students to face societal challenges.

PROGRAM CURRICULUM

3.1.1 Mandatory Courses and Credits

The B.Tech (Computer Science and Technology) Program structure (2020-2024) consists of a minimum of 61 Courses totaling 182 Credits.

Table 3.1.1 summarizes the type of Courses, number of Courses under each type and the associated Credits that are mandatorily required for the completion of the Degree.

3.1.1.1 Students have an option of obtaining a specialization in any of the prescribed minors by earning 15 credits from the Course Basket listed under that particular minor within the Discipline Elective Courses.



	TABLE 3.1.1 Courses and Credits								
S. No.	TYPE OF COURSES	NO. OF COURSES	CREDITS						
1	Humanities (HS)	3	6						
2	Management Sciences (MS)	2	6						
3	Basic Sciences (BS)	8	24						
4	Engineering Sciences (ES)	8	24						
5	Core (Professional) Course (CC)	20	63						
6	Discipline (Professional) Elective (DE)	10	30						
7	Open Elective (OE)	3	9						
8	Professional Practice (PP)	2	20						
9	Personal and Professional Skills (PPS) (Compulsory to be audited.)	4	0						
10	Social Immersion Course (SIC)	1	0						
	TOTAL	Minimum of 61	182						
Th	e mandatory minimum Credits required for Credits.	the award of the Degre	ee is 182						

The Table 3.1.1 is indicative of various components such as Foundation Courses (Basic Sciences, Engineering Sciences, Humanities, Social Sciences and Management Sciences), Professional Core, Discipline and Open Elective Courses. The unique feature of this Program is Professional Practice - I of 6-8 weeks during the end of 4th Semester and before the commencement of 5th Semester for the student to have industry exposure. The Professional Practice - II will be during their 7th / 8th Semester for about 15 weeks. Social Immersion Course, which is mandatory, is introduced in the curriculum for the student to give value of social service such as community service, clean and green, NSS, Protection of environment and health hazards, etc.

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Table 3.1.1 lists the mandatory Courses, type of Courses, number of type of Courses and the associated credits required for the completion of the B.Tech (Computer Science and Technology) Program.

3.1.2 B. Tech. (Computer Science and Technology) Program Suggested Year Wise Structure

Mandatory Minimum Credits required for the award of the B.Tech (Computer Science and Technology) Degree: 182

Fir	st Year		Second	Year		Third	l Year		Fou Yea	-
Physics Cycle Sem. 1/2	Chemistry Cycle Sem. 1/2		Sem.3	Sem 4	Summer Term/PP-		Sem 6		Sem 7	Sem 8
BS-3	BS-4	Summer Term	MAT – BS- 1	Mat - BS 1			DE -2 MS-1	Summer Term	DE-6 OE-1	PP-1
ES-4	ES-3		OE 1	DE 1		PP-1	Core-5 SIC -1			
HS-2	HS-1		PPS1	Core – 5 PPS-1		6				
PPS-1	PPS-1									

Nomenclature:

- BS Basic Sciences
- ES Engineering Sciences
- HS Humanities
- MS Management Sciences
- CC Core Course
- DE Discipline/Professional Electives
- **OE** Open Electives
- PP-I/PP-II Professional Practice
- PPS Personal and Professional Skills
- SIC Social Immersion Course

In the entire Program, the practical and skill based Course component contribute to an extend of approximately 30% out of the total credits of 182 for B.Tech (Computer Science and Technology) Program of four years duration.

3.2 SUGGESTED PROGRAM STRUCTURE

	I SEM - PHYSICS CYCLE (Aug-Dec)*											
S.	COURS				-	CDIT CTURE	CONTA	TYPE OF	COUR SE			
NO	E CODE	COURSE NAME	L	Т	Р	CREDI TS	CT HOURS	SKILL	ADDR ESSES TO			
1	MAT 105	Calculus and Linear Algebra	3	1	0	4	4	F ¹	-			
2	PHY 101	Engineering Physics	4	0	0	4	4	F	-			
3	EEE 101	Elements of Electrical Engineering	3	0	0	3	3	P ²	-			
4	CIV 101	Elements of Civil Engineering	3	0	0	3	3	Р	Env ⁴			
5	MEC 152	Engineering Graphics	2	0	4	4	6	Р	-			
6	ENG 103	Technical Written Communication	2	1	0	3	3	F/E ³	-			
7	KAN 101	Kannada Kali	1	0	0	1	1	F	-			
8	PHY 151	Engineering Physics Lab	0	0	2	1	2	F	-			
9	MEC 151	Workshop Practice	0	0	2	1	2	Р	-			
10	PPS 105	Building Self Confidence	0	0	2	0	2	Е	-			
		TOTAL	1 8	2	8	24	30					
	¹ Foundation Course ² Professional Skills					mployabili nvironmen						

	I SEM - CHEMISTRY CYCLE (Aug-Dec)#										
S. NO.	COURSE NAME				-	DIT CTURE	CONTACT HOURS	TYPE OF SKILL	COURSE ADDRESSES TO		
NO.	CODE		L	Т	Р	CREDITS	noons	SKILL	anna	STY III	
1	MAT 105	Calculus and Linear Algebra	3	1	0	4	4	F	REGISTRAR	Registrar	
2	CHE 101	Engineering Chemistry	4	0	0	4	4	F	-	* OANGALOE	

		TOTAL	1 9	1	8	24	30		
9	PPS 105	Building Self Confidence	0	0	2	0	2	F	PE⁵/S ⁶
8	CHE 151	Engineering Chemistry Lab	0	0	2	1	2	F	-
7	CSE 151	Computer Programming	2	0	4	4	6	E	-
6	ENG 104	Technical Spoken Communication	1	0	2	2	3	Е	-
5	CIV 102	Environmental Science and Disaster Management	3	0	0	3	3	F	Env
4	MEC 101	Elements of Mechanical Engineering	3	0	0	3	3	Ρ	-
3	ECE 101	Elements of Electronics Engineering	3	0	0	3	3	Ρ	-

⁵ Professional Ethics

⁶ Sustainability Issues

		II SEM - CHEM	IST	RY	CY	CLE (Jan-N	May)#		
S.	COURSE	COURSE NAME	SINCCICIC		CONTACT HOURS	TYPE OF	COURSE ADDRESSES TO		
NO.	CODE		L	Т	Р	CREDITS	nooks	SKILL	ADDRESSES TO
1	MAT 106	Calculus, Differential Equations and Complex Variables	3	1	0	4	4	F	-
2	CHE 101	Engineering Chemistry	4	0	0	4	4	F	-
3	ECE 101	Elements of Electronics Engineering	3	0	0	3	3	Ρ	-
4	MEC 101	Elements of Mechanical Engineering	3	0	0	3	3	Ρ	-
5	CIV 102	Environmental Science and Disaster Management	3	0	0	3	3	F	Env
6	ENG 104	Technical Spoken Communication	1	0	2	2	3	Е	-
7	CSE 151	Computer Programming	2	0	4	4	6	E	-
8	CHE 151	Engineering Chemistry Lab	0	0	2	1	2	F	REGISTRA
9	PPS 106	Effective Communication	0	0	2	0	2	E	-

	TOTAL	1 9	1	8	24	30		
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		II SEM - PH	YSIC	cs c	CYCI	LE (Jan-May)*			
S. NO.	COURSE CODE	COURSE NAME	(CRE	DIT	STRUCTURE	CONT ACT HOUR	TYPE OF SKILL	COURSE ADDRESSE
NU.	CODE		L	Т	Р	CREDITS	s		S TO
1	MAT 106	Calculus, Differential Equations and Complex Variables	3	1	0	4	4	F ¹	-
2	PHY 101	Engineering Physics	4	0	0	4	4	F	-
3	EEE 101	Elements of Electrical Engineering	3	0	0	3	3	P ²	-
4	CIV 101	Elements of Civil Engineering	3	0	0	3	3	Р	Env
5	MEC 152	Engineering Graphics	2	0	4	4	6	Р	-
6	ENG 103	Technical Written Communication	2	1	0	3	3	F/E ³	-
7	KAN 101	Kannada Kali	1	0	0	1	1	F	-
8	PHY 151	Engineering Physics Lab	0	0	2	1	2	F	-
9	MEC 151	Workshop Practice	0	0	2	1	2	Р	-
10	PPS 106	Effective Communication	0	0	2	0	2	E	-
		TOTAL	18	2	8	24	30		

Note: At the end of the 1st year (Common to all B. Tech. Programs) the total credits offered is 48.

The 1st year B.Tech Program structure is executed in two cycles. * The students undergoing the "Physics" cycle shall take the Courses as indicated.

[#] The students undergoing "Chemistry" cycle shall take the Courses as indicated

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		III SEMES	TER					
S.No.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE		CONTACT HOURS	TYPE OF		
			L	Т	Р	С		SKILL
1	MAT2001	Transform Techniques and Partial Differential equation	3	0	0	3	3	F
2	CSE2006	Data Structures	3	0	2	4	5	S
3	CSE2009	Computer Organization and Architecture	3	0	0	3	3	S
4	CSE2017	Graph Theory and Combinatorics	3	0	0	3	3	S
5	XXX XXXX	Open Elective – I	3	0	0	3	3	P/E
6	PPS107	Design Thinking and Team Building	0	0	2	0	2	Е
7	CSE2008	Programming in Java	1	0	4	3	5	S
8	CSE XXX	Discipline Elective – I	3	0	0	3	3	S/EM
		TOTAL	19	0	8	22	27	

*Student has to register for Social Immersion Course in any one semester 3/4/6 to earn the mandatory credits

	IV SEMESTER										
S.No.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE			RE	CONTACT HOURS	TYPE OF			
			L	Т	Р	С		SKILL			
1	MAT2002	Numerical Methods, Probability and Sampling Techniques	3	0	0	3	3	F			
2	CSE 2007	Design and Analysis of Algorithms	2	0	2	3	4	S			
3	ECE2002	Digital Electronics	3	0	2	4	5	S			
4	CSE 2010	Operating Systems	3	0	0	3	3	S			
5	CSE 2012	Database Management Systems	2	0	4	4	6	Same			
6	CSE 2016	Discrete Mathematical Structures	3	0	0	3	3	REGISTRAR			
7	XXX XXXX	Open Elective – II	3	0	0	3	3	P/E			
8	PPS108	Being Corporate Ready	0	0	2	0	2	E			

	TOTAL	19	0	10	23	29	
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		V SEMESTER					
S. No.	COURSE	COURSE NAME		RED	IT ST	CONTACT	
	CODE		LT		Р	CREDITS	HOURS
1	CSE 2014	Software Engineering	3	0	0	3	3
2	CSE2011	Data Communications and Networking	2	0	2	3	3
3	CSE2018	Theory of computation	3	0	0	3	3
4	CSE3001	Artificial Intelligence and Machine Learning	2	0	2	3	4
5	CSE2067	Web Technologies	2	0	2	3	4
6	MGT112/ MGT113	Engineering Economic/ Digital Entrepreneurship	3	0	0	3	3
7	CSE2026	Data Handling and Visualization	2	0	2	3	4
8	CSEXXXX	Discipline Elective-II	3	0	0	3	3
<mark>9</mark>	PIP101	Professional Practice - I	<mark>0</mark>	<mark>0</mark>	<mark>0</mark>	<mark>5</mark>	<mark>0</mark>
		TOTAL	20	0	8	29	27

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		VI SEMESTI	ER					
S.No.	COURSE CODE	COURSE NAME	s	~	EDIT CTUR	E	CONTACT HOURS	TYPE OF
			L	Т	Р	С	,	SKILL
1	CSE 3002	Big Data Technologies	2	0	2	3	4	EM
2	CSE 2013	Cloud computing	3	0	0	3	3	EM
3	CSE3036	Predictive Analytics	2	0	2	3	4	S
4	CSE3008	Machine Learning Techniques	2	0	2	3	4	S
5	CSE2060	Information Security and Management	3	0	0	3	3	EM
6	MGT112/MGT113	Engineering Economic/ Digital Entrepreneurship	3	0	0	3	3	P/E
7	CSEXXXX	Discipline Elective – III	3	0	0	3	3	S/EM
8	CSEXXXX	Discipline Elective – IV	3	0	0	3	3	S/EM
9	SIC 501	Social Immersion Course	0	0	0	0	0	Р
		TOTAL	21	0	6	24	29	

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	VII SEMESTER									
S.No.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE			-		TYPE OF SKILL		
			L	Т	Р	С				
1	CSEXXXX	Discipline Elective – V	3	0	0	3	3	S/EM		
2	CSEXXXX	Discipline Elective – VI	3	0	0	3	3	S/EM		
3	CSEXXXX	Discipline Elective – VII	3	0	0	3	3	S/EM		
4	CSEXXXX	Discipline Elective – VIII	3	0	0	3	3	S/EM		
5	CSEXXXX	Discipline Elective – IX	3	0	0	3	3	S/EM		
6	CSEXXXX	Discipline Elective – X	3	0	0	3	3	S/EM		
7	XXX XXXX	Open Elective – III	3	0	0	3	3	P/E		
		TOTAL	18	0	6	21	24			



		VIII SEMES	STER					
S.No.	COURSE CODE	COURSE NAME	:	CRI STRU	EDIT CTUR	E	CONTACT HOURS	TYPE OF
•	,	'	L	Т	Р	С		SKILL
1	PIP 102	Professional Practice II	<mark>0</mark>	<mark>0</mark>	<mark>0</mark>	<mark>15</mark>	<mark>0</mark>	<mark>S</mark>
		TOTAL	0	0	0	15	0	

		TABLE — 3.	2.1						
	LIST OF MANAGEMENT SCIENCES COURSES								
S.NO	COURSE CODE	COURSE NAME	L	Т	Р	С	CONTACT HOURS	TYPE OF SKILL	
1	MGT113	Digital Entrepreneurship	3	0	0	3	3	S/EM/E N	
2	MGT112	Engineering Economics	3	0	0	3	3	S	

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			Table 3	3.2.2				
		DISCI	PLINE	ELECTI	IVE			
S.NO	COURSE CODE	COURSE NAME	L	Т	Р	С	CONTAC T HOURS	TYPE OF SKILL
1	CSE2027	Fundamentals of Data Analysis	3	0	0	3	3	S/EM
2	CSE3082	Object Oriented Analysis and Design	3	0	0	3	3	S/EM
3	CSE2021	Data Mining	3	0	0	3	3	S/EM
4	CSE3073	Game Design and Development	3	0	0	3	3	S/EM
5	CSE3086	Information Theory and Coding	3	0	0	3	3	S/EM
6	CSE3146	Advanced Java Programming	1	0	4	3	5	S/EM
7	CSE2036	Programming in C++	1	0	4	3	5	S/EM
8	CSE3068	Advanced Database Management Systems	2	0	2	3	4	S
9	CSE3069	Introduction to Bioinformatics	3	0	0	3	3	F
10	CSE3070	Advanced Computer Networks	3	0	0	3	3	S/ EM
11	CSE3071	Computer Vision	2	0	2	3	3	F
12	CSE3072	Wireless Sensor Networks	3	0	0	3	3	S/EM
13	CSE3073	Game Design and Development	3	0	0	3	3	S
14	CSE3074	Microprocessors and Microcontrollers	3	0	0	3	3	S/EM
15	CSE3075	Mobile Application Development	1	0	4	3	5	S/EM/EN
16	CSE3077	Compiler Design	2	0	2	3	4	S/EM/EN
17	CSE3150	Front End Full Stack Development	2	0	2	3	4	EMaune
18	CSE3151	Java Full Stack Development	2	0	2	3	4	EM

19	CSE3152	.Net Full Stack Development	2	0	2	3	4	EM	
20	CSE2033	Go Programming	3	0	0	3	3	S/EM	
21	CSE2039	Ethical Hacking	2	0	2	3	4	S/EM	
22	CSE2024	NOSQL	2	0	2	3	4	S/EM	
23	CSE3050	Software Project Management	3	0	0	3	3	S/EM	
24	CSE3022	Cryptocurrency	2	0	2	3	4	S/EM	
25	CSE3075	Mobile Application Development	1	0	4	3	5	S/EM	
26	CSE2037	Cyber Forensics	2	0	2	3	4	S/EM	
27	CSE3046	DevOpsTools Internals	2	0	2	3	4	S/EM	



		ſ	Table 3.2	3					
	OPEN ELECTIVES OFFERED								
S.NO	COURSE CODE	COURSE NAME	L	Т	Р	С	CONTAC T HOURS	TYPE OF SKILL	
1	ECE1004	Microprocessor based Systems	3	0	0	3	3		
2	CIV 1001	Disaster Management & Mitigation (DM&M)	3	0	0	3	3		
3	CIV 2002	Occupational Health & Safety (OH&S)	3	0	0	3	3		
4	CIV 2001	Sustainaibility Concepts in Engineering (SCE)	3	0	0	3	3		
5	CIV 2004	Integrated Project Management (IPM)	3	0	0	3	3		
6	CIV 383	Infrastructure Systems for Smart Cities (ISSC)	3	0	0	3	3		
7	PET 2025	Oil and Gas Quality Management (O&GQM)	3	0	0	3	3		
8	PET 2028	Petroleum Economics (PE)	3	0	0	3	3		
9	PET 2023	Petroleum Corrosion Technology (PCT)	3	0	0	3	3		
10	PET 2026	Health, Safety and Environment (HS&E)	3	0	0	3	3		
11	EEE 1003	Basic Circuit Analysis using NI LAB view (BCA- NI LAB)	3	0	0	3	3		
12	EEE 1004	Automation and Control in Industries using PLC Programming (A&CI- PLC)	3	0	0	3	3	-	
13	CHE1011	Chemical and Petrochemical catalysts (C&PC)	3	0	0	3	3	REGISTRA	
14	CHE1009	3D printing with polymer (3DPP)	3	0	0	3	3		

15	CHE1015	Waste to fuel (WTF)	3	0	0	3	3		
16	CHE1008	Energy and Sustainability (E&S)	3	0	0	3	3		
17	MEC1001	Fundamentals of Automobile Engineering (FAUE)	3	0	0	3	3		
18	MEC1002	Introduction to Matlab and Simulink (IM&S)	3	0	0	3	3		
19	MEC1003	Engineering Drawing (ED)	3	0	0	3	3		
20	MEC2001	Renewable Energy Systems (RES)	3	0	0	3	3		
21	MEC2002	Operations Research & Management (OR&M)	3	0	0	3	3		
22	MEC2003	Supply Chain Management (SCM)	3	0	0	3	3		
24	MEC2004	Six Sigma for Professionals (SSP)	3	0	0	3	3		
25	MEC2005	Fundamentals of Aerospace Engineering (FAE)	3	0	0	3	3		
26	MEC2006	Safety Engineering (SE)	3	0	0	3	3		
27	MEC2007	Additive Manufacturing (AM)	3	0	0	3	3		
28	MEC3001	Electric Vehicles & Battery Technology (EV&BT)	3	0	0	3	3		
29	MEC3069	Engineering Optimisation (EO)	3	0	0	3	3		
30	MEC3070	Electronics Waste Management (EWM)	3	0	0	3	3		
31	MEC3071	Hybrid Electric Vehicle Design (HEVD)	3	0	0	3	3	0	0
32	MEC3072	Thermal Management of Electronic Appliances (TMEA)	3	0	0	3	3	REGISTRAR	

33	CIV 280	Environmental Impact Assessment (EIA)	3	0	0	3	3	
34	CIV 2044	Geospatial Applications for Engineers (GAE)	3	0	0	3	3	
35	CIV 382	Systems Design for Environment and Sustainability (SDES)	3	0	0	3	3	
36	CIV 383	Infrastructure Systems for Smart Cities (ISSC)	3	0	0	3	3	
37	CIV 1001	Disaster Management & Mitigation (DM&M)	3	0	0	3	3	
38	CIV 2004	Integrated Project Management (IPM)	3	0	0	3	3	
39	CIV 2002	Occupational Health & Safety (OH&S)	3	0	0	3	3	
40	PET 406	Polymer Technology (PT)	3	0	0	3	3	
41	PET 408	Oil and Gas Transportation and Marketing (O>&M)	3	0	0	3	3	
42	PET 409	Material Science and Engineering (MS&E)	3	0	0	3	3	
43	EEE 221	Energy Audit (EA)	3	0	0	3	3	
44	EEE 223	Smart Grid Technology (SGT)	3	0	0	3	3	
45	MEC 102	Automotive Vehicles (AV)	3	0	0	3	3	
46	MEC 103	Nanotechnology (NT)	3	0	0	3	3	
47	MEC 328	Engineering Optimisation (EO)	3	0	0	3	3	
48	MEC 329	Operations Research for Engineers (ORE)	3	0	0	3	3	
49	MEC 104	Operations Management (OM)	3	0	0	3	3	ame
50	MEC 105	Work Study (WS)	3	0	0	3	3	REGISTRAR

51	MEC 106	Project Management (PM)	3	0	0	3	3	
52	MEC 107	Organizational Behaviour (OB)	3	0	0	3	3	
53	MEC 330	Renewable Energy Systems (RES)	3	0	0	3	3	
54	MEC 331	Design of Automatic Control Systems (DACS)	3	0	0	3	3	
55	ECE295	Artificial Neural Networks (ANN)	3	0	0	3	3	
56	ECE 297	IOT: Internet of Things (IOT)	3	0	0	3	3	
57	ECE 299	Computational Intelligence and Machine Learning (CI&ML)	3	0	0	3	3	
58	ENG1012	Gender and Society in India - (G&S)	3	0	0	3	3	
59	ENG1008	Indian Literature - (IL)	3	0	0	3	3	
60	ENG1013	Indian English Drama - (IED)	3	0	0	3	3	
61	CIV1001	Disaster mitigation and management - (DM&M)	3	0	0	3	3	
62	CIV1002	Environment Science and Disaster Management - (ESDM)	3	0	0	3	3	
63	CIV2001	Sustainability Concepts in Engineering - (SCE)	3	0	0	3	3	
64	CIV2002	Occupational Health and Safety - (OH&S)	3	0	0	3	3	
65	CIV2003	Sustainable Materials and Green Buildings - (SM&GB)	3	0	0	3	3	
66	CIV2005	Environmental Impact Assessment - (EIA)	3	0	0	3	3	gume
67	EEE1006	Smart Sensors for Engineering Applications - (SSEA)	3	0	0	3	3	REGISTRAR

68	MEC 2005	Fundamentals of Aerospace Engineering - (FAE)	3	0	0	3	3	
69	MEC 1001	Fundamentals of Automobile Engineering - (FAUE)	3	0	0	3	3	
70	MEC 1003	Electronic Waste Management - (EWM)	3	0	0	3	3	
71	MEC 3070	Engineering Drawing - (ED)	3	0	0	3	3	
72	MEC 1005	Workshop Practice - (WSP)	3	0	0	3	3	
73	MEC2001	Renewable Energy Systems - (RES)	3	0	0	3	3	
74	CHE1013	Chemistry for engineers - (CFE)	3	0	0	3	3	
75	CHE1006	Introduction to Nano technology - (INT)	3	0	0	3	3	
76	CHE1004	Smart materials for IOT - (SMFI)	3	0	0	3	3	
77	CHE1014	Surface coatings technology and corrosion Science - (SCT&CS)	3	0	0	3	3	
78	CHE1010	Bioinformatics - (BI)	3	0	0	3	3	
79	CHE1008	Energy and sustainability - (E&S)	3	0	0	3	3	
80	COM 2004	Introduction to Banking - (ItoB)	3	0	0	3	3	
81	COM 2001	Introduction to Human Resource Management - (IHRM)	3	0	0	3	3	
82	PET1006	Overview of Energy Industry - (OEI)	3	0	0	3	3	
83	PET1005	Geology for Engineers - (GFE)	3	0	0	3	3	0
84	ECE1004	Microprocessor Based Systems - (MBS)	3	0	0	3	3	RECISTRAR

85	ECE1005	Fundamentals of Communication Systems - (FCS)	3	0	0	3	3	
86	MBA1004	Essentials of Leadership - (EL)	3	0	0	3	3	
87	DES2001	Design Thinking - (DT)	3	0	0	3	3	
88	DES1121	Introduction to UX Design - (IUXD)	3	0	0	3	3	
89	DES1122	Introduction to Jewellery Making - (IJM)	3	0	0	3	3	
90	DES1123	Introduction to packaging Design - (IPD)	3	0	0	3	3	
91	DES1124	Spatial Stories - (SS)	3	0	0	3	3	
92	DES1125	Wonder clay - (WC)	3	0	0	3	3	



3.3 COURSE DESCRIPTION AND SYLLABUS

Course Name:	Calculus and Linear Algebra							
Course Code:	MAT 105	Cradit Structura :	L	Т	Р	С		
		Credit Structure :	3	1	0	4		

Course Description: This course aims to introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions. Also introduces the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems. Develops the tool of power series and Fourier series for learning advanced Engineering Mathematics. Familiarize the student with functions of several variables that is essential in most branches of engineering and develop the essential tool of matrices and linear algebra in a comprehensive manner.

Textbooks:

1. Erwin Kreyszig, "*Advanced Engineering Mathematics*", 9th Edition, John Wiley & Sons, 2006. Reference Books:

2. B. S. Grewal, 'Higher Engineering Mathematics", Khanna Publishers, 36th Edition 2010.

3. Cengage, Mathematics – I (Calculus & Linear Algebra), ITL Education Solutions Ltd., 2018.

REGISTRAR

Course Name:	Engineering Physics					
Course Code:	РНҮ 101	Credit Structure .	L	Т	Р	С
		Credit Structure :	4	0	0	4

Course Description: The main objective of this course is to study the basic concepts of physics that helps developing the ability to identify, formulate and apply to engineering applications. This course covers the areas, namely, applied physics and modern physics. The course includes the concepts of free electron theory, electrical properties and applications of contemporary and useful materials such as semiconductors, superconductors and dielectric materials are discussed in detailed manner. It also emphasizes on modern concepts such as the concepts of lasers and its applications in the field of optical fiber communication system and other areas. Finally, the need of quantum mechanics, the quantum approach concepts like, matter waves, Heisenberg's uncertainty principle, Schrodinger's time independent equation and application of Schrodinger's wave equation are discussed.

Textbooks:

1. Wiley, Engineering Physics, 2014 Wiley India.

- 1. G Aruldhas, Engineering Physics, 2014 PHI Learning Pvt. Ltd, Delhi.
- 2. M.N Avadhanulu, P G Kshirsagar, Engineering Physics, 2010 S Chand & Co. Pvt. Ltd.
- 3. Md. N. Khan, S Panigrahi, Principles of Engineering Physics 1 & 2, 2014 Cambridge Univ. Press.
- **4.** Serway Raymond and Jewett John, *Physics for Scientists and Engineers with Modern Physics*, 2003 Cengage.
- 5. Arthur and Beiser Concepts of Modern physics 2017 7th Edition McGraw Hill Education.

REGISTRAR

Course Name:	Elements of Electrical Engineering						
Course Code:	EEE 101	Cuadit Structure .	L	Т	Р	С	
		Credit Structure :	3	0	0	3	

Course Description: The course aims at nurturing the students with the significance of Electrical Engineering. The course provides exhaustive knowledge about the basic laws of electrical sciences, AC/ DC circuit analysis, AC & DC machines. It also includes Measuring Instruments, Earthing, Electrical wiring and safety measures.

Textbook:

1. John Hiley, Keith Brown and Ian McKenzie Smith, "Hughes Electrical and Electronic Technology", Pearson.

- 1. K Uma Rao and A Jayalakshmi, "*Basic Electrical Engineering*" 2016 Revised Edition, I K International Publishing House Pvt. Ltd.
- 2. D.P. Kothari, I. J. Nagrath, "Basic Electronics", McGraw Hill Education.
- 3. Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", PHI.



Course Name:	Elements of Civil Engineering							
Course Code:	CIV 101	Credit Structure .	L	Т	Р	С		
		Credit Structure :	3	0	0	3		

Course Description: The objective of this Course is to make students learn the basics of Civil Engineering concepts, role of civil engineers, infrastructure development, sustainability, and solve problems involving forces, loads and moments and know their applications in allied subjects. It is a pre-requisite for several Courses involving Forces and Moments.

The students should have a prior knowledge of basic mathematics and physics to pursue the Course. The Course consists of an introduction of civil engineering through an exposition of its disciplines, types of Infrastructure, different types of construction materials, composition of forces, concepts of resultants and equilibrium of forces.

After successful completion of the Course, the students would acquire knowledge on the basics of Civil Engineering, its scope of study, knowledge about green buildings, roads, airports, bridges and dams. They would be able to comprehend the action of Forces, Moments and other loads on systems of rigid bodies; Compute the reactive forces and the effects that develop as a result of the external loads.

Textbooks:

- 1. M.N. Shesha Prakash, Ganesh B. Mogaveer, "Elements of Civil Engineering and Engineering Mechanics", PHI Learning.
- 2. Mimi Das Saikia, Bhargab Mohan Das and Madan Mohan Das, "Elements of Civil Engineering", PHI Learning Pvt Ltd.

- 3. Shrikrishna A Dhale and Kiran M Tajne, "Basics of Civil Engineering", S Chand Publication.
- 4. S. S. Bhavikatti, "Basic Civil Engineering", New Age International Publication
- 5. Satheesh Gopi, "Basic Civil Engineering", Pearson Publication

REGISTRAR

Course Name:	Engineering Graphics					
Course Code:	MEC 152	Credit Structure .	L	Т	Р	С
		Credit Structure :	2	0	4	4

Course Description: The course is designed with the objective of giving an overview of engineering drawing with the help of software tools. It is introductory in nature and acquaints the students with the techniques used to create engineering drawings with computerised drafting tools. Computerised drafting provides accurate and easily modifiable graphic entities, easy data storage, easy retrieval facility and it enhances creativity. It will expose students to the concept of engineering drawing and teach them to draw different views of planes and solids in different orientations.

The course will teach students to use AutoCAD to produce engineering drawings. They will learn to create drawing layouts, dimensioning, the theory of projection, orthographic projection of points, lines, planes and solids, isometric projection and be introduced to the development of surfaces.

Textbook:

1. N. D. Bhatt, "Engineering Drawing: Plane and Solid Geometry," Charotar Publishing House Pvt. Ltd.

Reference Books:

1. D. A. Jolhe, "Engineering Drawing: With an Introduction to AutoCAD," Tata McGraw Hill.

2. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, "Engineering Graphics with AutoCAD," Prentice Hall.

Course Material:

"Engineering Graphics Lab Manual," Presidency University

REGISTRAR

Course Name:	Technical Written Communication							
Course Code:	ENG 103	Credit Structure :	L	Т	Р	С		
			2	1	0	3		

Course Description: A course on Technical Written Communication facilitates writing skills; letters, emails, notice, agenda, minutes of the meeting, reports, etc. The course will train the students to write better English and face the corporate wold with determination and self belief. The course includes theoretical session on communication, reading and writing skill with special emphasis on letters, emails and reports. Practical sessions in form of tutorials will help the students to practice vocabulary, reading, common errors, sentence transformations, etc.

- 6. Greg Satell. "Why Communication is Today's Most Important Skill." FORBES. Feb 6, 2015.
- 7. Bacon, Francis. "Of Studies." Selected Writings of Francis Bacon. Ed. Hugh G. Dick. New York. Random House, 1955. P. 22.
- 8. Bovee, Courtland L. Thill, John V, Chatterjee. Abha. *Business Communication Today*. 10th Edition. Pearson.
- 9. Raman, Meenakshi. Sharma, Sangeetha. *Technical Communication: Principles and Practice*. Oxford University Press, New Delhi. 2015.
- 10.Hart, Steve. Nari, Aravind R. and Bhambhani, Veena. Embark: *English for Undergraduates*. New Delhi; Cambridge University Press, 2016.
- 11. Online Resources: a. Globarena Online Language Learning Software

REGISTRAR

Course Name:	Engineering Physics Lab					
Course Code:	PHY 151	Credit Structure .	L	Т	Р	С
		Credit Structure :	0	0	2	1

Course Description: This Course includes the laboratory sessions on determination of the wave length of Laser, rigidity modulus, Planck's constant, dielectric constant, radius of curvature by Newton's rings, calculation of Numerical Aperture, Resistivity by four probe method, Fermi energy of copper and acceleration due to gravity by simple pendulum. It also includes experiments on characteristics of Zener diode.

Course Material: "Engineering Physics Lab manual" Presidency University (2020-21).



Course Name:	Workshop Practice							
Course Code:	MEC 151	Credit Structure .	L	Т	Р	С		
		Credit Structure :	0	0	2	1		

Course Description: The primary objective of this course is to expose students to the basic skills in handling various tools in a workshop and cover some of the processes used for converting raw materials to finished products.

The course involves a hands on approach to fitting of metal components, concept of development of surfaces through sheet metal work, usage of engineering measurement devices, metal joining by arc welding, and an introduction to plumbing and electrical connections.

Course Material:

"Engineering Workshop Lab Manual," Presidency University, 2017-18.

Reference Books:

1. B. S. Nagendra Parashar, R. K. Mittal, "Elements of Manufacturing Processes," Prentice Hall of India.

2. S. K. Hajra Choudhury, "Elements of Workshop Technology - Volume I - Manufacturing Processes," Media Promoters and Publishers Pvt. Ltd.



Course Name:	Calculus, Differential H	Calculus, Differential Equations and Complex Variables						
Course Code: N	MAT 106	Credit Structure .	L T	Р	С			
	MAT 100	Credit Structure :	3	1	0	4		

Course Description: This course aims to acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage. Also to introduce effective mathematical tools for the solutions of differential equations that model physical processes and introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.

Textbooks:

4. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.

- 5. B. S. Grewal, 'Higher Engineering Mathematics'', Khanna Publishers, 44th Edition, 2007.
- 6. Cengage, Mathematics II (Calculus, Ordinary Differential Equations & Complex Variables), ITL Education Solutions Ltd., 2018.



Course Name:	Transform Techniques, Partial Diff	Transform Techniques, Partial Differential Equations					
Comme Coder	MAT 2001	Credit Structure :	L	Т	Р	С	
Course Code:	MAT 2001		3	0	0	3	

Course Description: This course aims to introduce Fourier transform, z-transform and Laplace transform. The topics include the applications of Laplace transform in LCR circuits and solution of difference equations using z-transform. This course is commonly designed for all engineering branches and the contents learned in the previous semester are the prerequisite for this course. Solution of second and higher order, linear ordinary differential equations with constant and variable coefficients. Formation of Partial Differential Equations (PDE), solution of homogeneous and non-homogeneous PDEs and the application of PDEs. Laplace transforms of functions and properties; Laplace transform of periodic and unit step functions. Inverse Laplace Transforms, Application of Laplace transforms and solution of differential equations.

The course aims at introducing students to quantitative uncertainty analysis and risk assessment for engineering applications. Probability theory is of great use in understanding and modeling phenomena that exhibit random behavior and the emphasis is on real-world applications to engineering problems. The topics covered include basic concepts of probability and conditional probability, Baye's law and correlation analysis, Linear Regression and method of least square.

Textbooks:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons (India), 2014.

2. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, 2014.

Reference Books:

1. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Edition, Cengage Learning, 2012.

2. Ronald E. Walpole, Raymond H. Myers & Sharon L. Myers, "Probability & Statistics for Engineers & Scientists", Ninth Edition.

REGISTRAR

Course Name:	Numerical Methods, Probability Di	Numerical Methods, Probability Distributions and Sampling Techniques						
Comme Contra	CSE2002	Cuedit Stansature	L	Т	Р	С		
Course Code:	ode: CSE2002 Credit Structure :	3	0	0	3			

Course Description: The objective of Engineering Mathematics – IV is to equip the students with adequate knowledge of basic mathematics that will enable them in formulating problems and solving them analytically as well as numerically in their Engineering programme. The course enables students to incorporate the knowledge of complex variables and their significance in engineering, Numerical methods and sampling theory to support their concurrent, subsequent engineering studies to explore complex systems, physicists, engineers and mathematicians require computational methods since mathematical models are rarely solvable analytically. This course provides an introduction to basic numerical methods such as fitting of various curves, interpolation, differentiation, integration. This course also provides an introduction to numerical solution of algebraic and transcendental equations, ordinary differential equations such as Taylor's series method, modified Euler's method and Runge-Kutta Methods. The course aims at introducing students to quantitative uncertainty analysis and risk assessment for engineering applications. Probability theory is of great use in understanding and modeling phenomena that exhibit random behavior and the emphasis is on real- world applications to engineering problems, sampling distributions of means and variances, chi-squared, t and F distributions, methods of estimation, estimating means, proportions and variances, maximum likelihood estimation, tests of hypothesis on means, proportions and variances, chisquared test of goodness of fit.

Textbooks

- 1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons (India), 2014.
- 2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computations, 6th Edition, New age Publishing House, 2015.
- 3. Ronald .E. Walpole, Raymond. H. Myers, Sharon. L Myers, and Keying E.Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Delhi-9th edition, 2012.

Reference Books

- 1. B.S. Grewal, "Higher Engineering Mathematics", 43rd edition, Khanna Publishers.
- 2. B.S. Grewal, Numerical methods in engineering and science, 10th Edition, Khanna publishers, 2016.

Kishor S Trivedi, "Probability ansd Statistics with reliability, Queuing and Computer Science Applications", John Wiley & Sons, 2nd edition, 2008.

REGISTRAR

Course Name:	Building Self Confidence					
Course Coder	DDS 105	Credit Structure .	L T	Р	С	
Course Coue:	ourse Code: PPS 105 Credit Structure :	0	0	2	0	

Course Description: Developing right attitude, effective communication skills and confidence to be successful in this highly competitive environment is of utmost importance. This course helps the students to develop their personality and drives them to create their personal brand. The students are exposed to various fun-filled activities to gain confidence in facing people, facing crowd and expressing their ideas.

Textbooks:

Building Self Confidence Training Manual

Reference Books:

12. Prakash Iyer, "The Habit of Winning", 2nd Edition, Penguin Books Ltd., 2016.

13. Jack Canfield, "The Success Principles", 8th Edition, HarperCollins Publishers India, 2015.

14. Shiv Khera, 3d Edition, "You Can Win", Bloomsbury India, 2014.



Course Name:	Engineering Chemistry					
Course Code: CHE 101		Cradit Structure .	L T	Р	С	
	Credit Structure :	4	0	0	4	

Course Description: The primary objective of the course is to introduce the students to the concepts and applications of chemistry in Engineering. It should cultivate in them an ability to identify chemistry in each piece of finely engineered products used in households and industry. It aims to strengthen the fundamental concepts of chemistry and then builds an interface with their industrial applications. It deals with applied and industrially useful topics, such as Water Technology, Engineering materials such as Polymers & Liquid crystals, Introduction to Computational Chemistry, Electrochemistry principles & its application to batteries, Corrosion and its control, Fuels and combustion.

Textbooks:

1. Wiley, "Engineering Chemistry", Wiley.

- 1. Dr. K. Pushpalatha, "Engineering Chemistry", Revised Edition, Wiley.
- F Jain and Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company. New Delhi, 2019.
- 3. Koch, W., & Holthausen, M. C. (2015). A chemist's guide to density functional theory. John Wiley & Sons.
- 4. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, 2015.
- 5. Principles of Physical Chemistry B.R.Puri, L.R. Sharma & M.S. Pathania, S. Nagin Chand & Co., 41 Ed., 2004.
- 6. F.W. Billmeyer, Text Book of Polymer Science, John Wiley & Sons, 4th Edition, 1996.
- 7. M.G. Fontana, N. D. Greene, Corrosion Engineering, McGraw Hill Publications, New York, 3rd Edition, 1996.
- 8. Jurs, P.C., 1996. Computer software applications in chemistry. John Wiley & Sons.
- 9. Stephen Wilson (auth.) Chemistry by Computer: An Overview of the Applications of Computers in Chemistry-Springer US (1986).

REGISTRAR

Course Name:	Elements of Electronics Engineering						
Course Code: ECE 101 Cr	ECE 101	Credit Structure .	L	Т	Р	С	
	Credit Structure :	3	0	0	3		

Course Description: The course aims at nurturing the students with the fundamental principles of electronics engineering, prevailing in various engineering applications. The course begins with the fundamentals of electronic systems and some basic laws of electricity. The topics include: classification of materials, types of Semiconductor materials, p-n Junction, Diodes, Characteristics, Rectifiers, Junction Transistor, BJT Configurations, Characteristics, BJT Biasing basics, Transistor Applications. Subsequently the student is introduced to Digital Electronics – Codes and Number systems – viz. Decimal, Binary and hexadecimal systems, conversions. 1's and 2's complements, binary addition. Boolean logic, basic gates and Universal Gates, and laws for reduction of the logic expressions, implementation using basic gates. Basics of communication systems, introduction to microprocessors and its applications.

Textbooks:

15. John Hiley, Keith Brown and Ian McKenzie Smith, "Hughes Electrical and Electronic Technology", Pearson.

Reference Books:

16. Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", PHI.

17.D.P. Kothari, I. J. Nagrath, "Basic Electronics", McGraw Hill Education.

18. Rajendra Prasad, "Fundamentals of Electronics Engineering", Cengane Learning.



Course Name:	Elements of Mechanical Engineering						
Course Codes	MEC 101	Credit Structure .	L T	Т	Р	С	
Course Coue:	Course Code: MEC 101 Ci	Credit Structure :	3	0	0	3	

Course Description: This course is designed to acquaint students with the fundamentals of mechanical engineering by covering some basics of thermal engineering, design engineering and manufacturing processes.

The discussion on thermal engineering includes the study of different forms of energy, the laws of thermodynamics, properties of steam, heat engines, heat pumps, steam boilers and an introduction to fluid properties and machinery. The discussion on design engineering covers transmission of motion and power. The discussion on manufacturing processes includes metal cutting and machines tools.

Textbooks:

19.K. P. Roy, S. K. Hajra Choudhury, Nirjhar Roy, "*Elements of Mechanical Engineering*," Media Promoters and Publishers Pvt. Ltd. Mumbai.

Reference Books:

20. Pravin Kumar, "Basic Mechanical Engineering," Pearson.

21.V. K. Manglik, "Elements of Mechanical Engineering," PHI.

22.Dr. D. S. Kumar, "Elements of Mechanical Engineering," S. K. Kataria & Sons.



Course Name:	Environmental Science and Disaster Management						
Course Code:	CIV 102	Credit Structure .	L	Т	Р	С	
	CIV 102	Credit Structure :	3	0	0	3	

Course Description: The overall objective of the course is to provide clear understanding of natural resources, environment, its maintenance and the basic concepts of disaster management. The course consists of the concepts of renewable and non-renewable resources, conservation of these resources, ecosystems, role of human being in maintaining a clean and useful environment for the future generations, maintaining ecological balance and conservation of biodiversity. It includes causes of environmental deterioration and its control; human environmental disturbances, water and air pollution, mitigation measures, disaster and waste management etc. After successful completion of the course, the students would be able to understand the various types of natural resources and problems due to over exploitation. Also gain knowledge about the different components of the ecosystem, their interrelation, various hazards, natural disasters, their effects and management.

Textbooks:

1. Benny Joseph, "Environmental Studies", McGraw-Hill.

- 2. R. Rajagopalan, "Environmental studies-From Crisis to Cure", Oxford University Press.
- 3. P. Anandan and R. Kumaravelan, "Environmental Science and Engineering", Scitech.
- 4. ErachBharucha, "Environmental Studies for Undergraduate courses", Universities Press.
- 5. R.B. Singh (Ed), "Disaster Management", Rawat.
- 6. MahuaBasuand S. Xavier "Fundamentals of Environmental Studies" Cambridge University Press.

REGISTRAR

Course Name:	Technical Spoken Communication						
Course Code: ENG 104	ENC 104	Cradit Structure .	L T	Т	Р	С	
	Credit Structure :	1	0	2	2		

Course Description: A Course on Technical Spoken Communication in the field of technical education will train the students to speak better English and face the corporate world with determination and selfbelief. The theoretical and practical sessions on pronunciation, listening, conversation, narration, speech presentation, will make the target audience to stand out in the forefront of their field of operation. At the end of the course, the students will have better skills, and the students will also be able to excel in middlehigher level management in the corporate world.

- 1. Tomson, Robert. "The Interview." Stories of Work, Life and the Balance in Between. The Write Place.
- 2. Daniel. J. C. "Unforgettable Salim Ali." *Inspiring People: Fifty People Who Made a Difference*. Readers Digest Selection.
- 3. Bovee, Courtland L. Thill, John V, Chatterjee. Abha. *Business Communication Today*. 10th Edition. Pearson
- 4. Carmine, Gallo. "11 Presentation Lessons You Can Still Learn From Steve Jobs." FORBES, October 12, 2012.
- 5. Thrishna's: How to Do well in GDs and Interview. New Delhi: Pearson 2013
- 6. Raman, Meenakshi. Sharma, Sangeetha. *Technical Communication: Principles and Practice*. Oxford University Press, New Delhi. 2015.
- 7. Hart, Steve. Nari, Aravind R. and Bhambhani, Veena. Embark: *English for Undergraduates*. New Delhi; Cambridge University Press, 2016.
- 8. J. K. Gangal, A Practical course in Spoken English, PHL Learning Private Limited, Delhi-2014.

REGISTRAR

Course Name:	Kannada Kali					
Course Code: KAN 101	IZ A NI 101	Cuedit Star stars	L T	Р	С	
	KAN IUI	Credit Structure :	1	0	0	1

Course Description: This course aims to help the non Kannada speaking students to converse in Kannada for their day-to-day life activities. It supports to develop strong cognitive skills, use of local language, helps to mingle with the local society, ensures security, facilitates interaction with auto and cab drivers, shop owners, employees of local government, etc. It also helps Law students to understand local client's complaints and also to the students of Engineering for a better communication. Furthermore, this course is offered to all the students, irrespective of their domain.

Text Books:

- 1. G Kannada Kali Linga Devaru Hale Mane, Publication Prasaranga Kannada Vishvavidyalaya, Hampi.
- 2. Spoken Kannada Publication Kannada Sahitya parishath Bengaluru.
- 3. Kannada Kirana Publication Bangaore Institute of Languages, Bangalore.



Course Name:	Computer Programming					
Course Code: CSE 151	CSF 151	Cradit Structura :	L T	Р	С	
	CSE 151	Credit Structure :	2	0	4	4

Course Description: This course will provide an introduction to foundational concepts of computer programming to students of all branches of Engineering. This module includes a mix of traditional lectures and laboratory sessions. Each meeting starts with a lecture and finishes with a laboratory session. Topics covered in this course are problem formulation and development of simple programs, Pseudo code, Flow Chart, Algorithms, data types, operators, decision making and branching, looping statements, arrays, functions, pointers, structures, union and basic file operations. In the lab secession students are required to solve problems based on the above concepts to illustrate the features of the structured programming.

Textbook:

1. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill.

Reference Books:

1. Yale Patt, Sanjay Patel, "Introduction to Computing Systems: From bits and gates to C and beyond", McGraw Hill.

2. Ehrouz A Forouzan, Richard F Gilberg, "*Computer science: A structured programming approach using C*", Cengage Learning.



Course Name:	Engineering Chemistry Lab					
Course Coder	CHE 151	Credit Structure :	L T		Р	С
Course Coue:	Course Code: CHE 151 Cre	Credit Structure :	0	0	2	1

Course Description: The lab course intends to train the students to develop their experimental skills and apply fundamental chemical principles in problems related to chemistry in engineering. The experiments are designed to support the theory lectures and the hands-on experience will thus enhance students' in understanding the concepts.

The course includes the estimation of total hardness of water by EDTA complexometric method, determination of the total alkalinity of a given water sample, estimation of Iron (II) in Mohr's salt, estimation of calcium oxide in cement, determination of Chemical Oxygen Demand (COD) of Industrial Waste Water sample, determination of pKa value of weak acid using pH meter, Estimation of copper colorimetrically, determination of Iron (II) by potentiometry, determination of viscosity co-efficient of a liquid using Ostwald's Viscometer, estimation of strength of mixture of acids by conductometry method.

Course Material: "Engineering Chemistry Lab Manual", Presidency University.



Course Name:	Calculus, Differential Equations and Complex Variables					
Course Code	ourse Code: MAT 102 Credit Structu	Credit Structure .	L	Т	Р	С
Course Code:		Credit Structure :	3	1	0	4

Course Description: This course is also commonly designed for all engineering branches and the contents learned in the previous semester are the prerequisite for this course. Probability theory is of great use in understanding and modeling phenomena that exhibit random behavior and the emphasis is on real-world applications to engineering problems. The topics covered include basic concepts of probability and conditional probability, Baye's law and correlation analysis, Linear Regression and method of least square, Solution of second and higher order, linear ordinary differential equations with constant and variable coefficients. Formation of Partial Differential Equations (PDE), solution of homogeneous and non-homogeneous PDEs and the application of PDEs. Evaluation of double and triple integrals, change of order of integration, change of coordinates, beta and gamma functions, line integral, surface integral and volume integral of vector and scalar functions. Laplace transforms of functions and properties; Laplace transform of periodic and unit step functions. Inverse Laplace Transforms, Application of Laplace transforms and solution of differential equations.

Textbooks:

- 1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley-India Publishers, 2014.
- 2. Ronald E. Walpole, Raymond H. Myers, Sharon. L. Myers and Keying E. Ye, *Probability and Statistics for Engineers and Scientists*, Pearson Education, Delhi. 9th Edition, 2012.

- 1 Peter V. O'Neil, Advanced Engineering Mathematics, 7th Edition, Cengage Learning, 2012.
- 2 B. S. Grewal, Higher Engineering Mathematics, 43rd edition, Khanna Publishers, 2014.

REGISTRAR

Course Name:	Effective Communication					
Course Code	PPS 106	Curdit Starstans		Т	Р	С
Course Code:	PPS 106	Credit Structure :	0	0	2	0

Course Description: In order to succeed in the world that has become more global than being confined to smaller areas, we need to be very good in communication. This programme introduces students to different techniques of communication that makes them communicate clearly and effectively. During this programme, students are given a lot of exercises to inculcate better flow of thought and speech with emphasis on being effective in communication.

Text Book:

1. Presidency University "Effective Communication" Training Manual

Course Name:	Design Thinking and Team Building					
Course Code:	PPS107	Cuadit Structure .		Т	Р	С
Course Coue:	FF5107	Credit Structure :	0	0	2	1

Course Description

Developing right attitude, effective communication and problem solving skills along with confidence is very essential in this highly competitive environment. This course helps the students to develop the necessary attitudes and traits of problem solving coupled with thinking out of the box, brainstorming, root cause analysis etc. and adds to the students' overall personality and drives them to solve problems and innovate. The students are exposed to various type of problem solving techniques followed by simulation exercises, group brainstorming and other activities like discussions, case-studies etc. The students get the right guidance from the faculty to develop and polish their skills which will make them successful in the corporate world.

Books:

(i) Textbook(s)

Design Thinking & Team Building Training Manual

(ii) Reference Book(s)

Emrah Yayici, "Design Thinkking Methodology Book" Diane Deacon and Mike Vance, "*Think Out Of The Box*" John Adair, "*Decision Making and Problem Solving Strategies*" John Adair "*The Art Of Creative Thinking*"

REGISTRAR

Course Name:	Being Corporate Ready					
Course Code:	DDS109	Creadit Strengtones -	L	Т	Р	С
Course Coue:	rse Code: PPS108 Credit Structure :	0	0	2	1	

Course Description

Being Corporate Ready (BCR) is to help the students to get a glimpse of the acceptable corporate readiness and equip them with the fundamental necessities of being able to confidently deal with the highly competitive corporate environment. This course helps the students to develop the necessary skills like Presentation Skills, E-mail Etiquette, Group Discussion, Personal Interview and Resume Building etc. This course will definitely add value to the students in terms of their overall personality development and drive them to be acceptable in corporate world with essential skills required and create their own personal brand.

The students are exposed to the corporate culture through real-time presentations, real-life e-mail writing scenarios, group discussions and other allied activities like discussions, case-studies, role-plays etc.

The students will get the right guidance from L&D faculty members to help develop and polish their skills which will make them successful in corporate environment.

Books: (i) Textbook(s)

Being Corporate Ready Training Manual

(ii) Reference Book(s)

"Group Discussion and Interview Skills by Pataki, Priyadarshi, Cambridge University Press: 2016" Prakash Iyer, "The Habit of Winning', Second Ed, Penguin Books Ltd, 2016. Jack Canfield, "The Success Principles", 8th Edition, Harper Collins India, 2015

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I. Course Catalogues:

Each course shall have a course catalogue with the following details:

- i) Pre –Requisites of the course
- ii) Course Description
- iii) Course Outcome
- iv) Course Content
- iv) Reference Resources.

The Course Catalogues for the Courses offered in each basket are attached below:

Course Code: CSE1001	Course Title: Introduction to Object Oriented Programming Type of Course: Program Core Theory and Laboratory Integrated	L-P-C	1	4	3	
Version No.	1.0	1				
Course Pre- requisites	NIL					
Anti-requisites	s NIL					
Course Description	This course introduces the core concepts of object-oriented programming. This course has theory and lab component which emphasizes on understanding the implementation and application of object-oriented programming paradigm. It helps the student to build real time secure applications by applying these concepts and also for effective problem solving. The students interpret and understand the need for object oriented programming to build applications.					
Course Out Comes	 On successful completion of the course the students shall be able to: 1. Write programs using basic concepts. 2. Apply the concept of arrays, strings, polymorphism & inheritance for building desktop 3. Implement interface building secure applications 4. Apply the concepts of error handling mechanism 5. Apply the concepts of input output streams to develop simple applications. 					
Course Content:			$\left(\right)$	abull	ACV US	

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Module 1	Introduction to Principles of Programming	Assignment	Programming	No. of Classes:10
•	m Solving using algorithms 5, Environment set up to ru e Arguments.			
Module 2	Data Types, Variables and Control Statements	Assignment	Programming	No. of Classes:6
Topics:				
••	riables, Identifiers, Operator trol Statements: Branching a	· •	xpression, Basic Input/ Out	tput,
Module 3	Object Oriented Concepts	Assignment	Programming	No. of Classes:8

Topics: Object Oriented Principles

Introduction to object Oriented Principles: Object, class, Data abstraction, Encapsulation, Polymorphism, Inheritance.

Classes, Objects and Methods: Defining a class, access specifiers, instantiating objects, reference variable, accessing class members and methods, constructors, method overloading, constructor overloading, static members and static methods.

Module 4	Arrays, String, Inheritance and Interface	Assignment	Programming	No. of Classes:12
----------	--	------------	-------------	----------------------

Topics: Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array. Passing arrays to method, returning arrays.

Creating Strings & Operation on String.

Defining a subclass, Types of Inheritance, Method overriding, Dynamic method invocation.

Interface - Definition, Implementing interface, abstract methods.

				5
Module 5	Exception Handling and Input Output Streams	Assignment	Programming	REGISTRAR Registrar No. of Classes:12

Exceptions: Types of Exceptions, Handling the Exception with try, catch, finally.

Streams: Type of Streams, Input Stream, Output Stream, File - writing to the File and Reading from the File, Serialization.

List of Laboratory Tasks:

Experiment No 1: Problem Solving Level 1: Problem solving using Algorithms and Flowcharts.

Experiment No. 2: Programming assignment using Variables and Expression
 Level 1: Basic programs using data types and variables
 Level 2: Programs using operators and flow control statements.

Experiment No. 3: Programming assignment using Object Oriented Concepts
 Level 1: Programming scenarios which build class, methods to solve a problem.
 Level 1: Programming scenarios which uses Constructors and Method overloading to solve a problem.

Experiment No. 3: Programming assignment using Arrays and Strings. (Application: Develop application on Matrices, build String based application like Telephone directory)

Level 1: Programming scenarios which build single dimensional and multidimensional array, apply the different methods to operate on strings.

Level 2: Programming assignment which will manipulate the data stored in matrices and identify the appropriate usage String methods.

Experiment No. 4: Programming assignment using Inheritance

Level 1: Programming assignment on building applications using Inheritance.

Experiment No. 5: Programming assignment using Interface Level 1: Programming scenarios for building applications using Interface.

Experiment No. 6: Programming assignment using Exception Handling.Level 1: Programming Scenarios to apply and use the exception handling mechanism.

Experiment No. 7: Programming assignment to build Input Output based Applications.Level 1: Programming Scenarios to build IO based application for a given scenario using File Handling concepts.

Targeted Application & Tools that can be used:

- Platform independent Application Development
- Secure Application Development
- Database Management Systems
- Banking software
- Mobile Applications

Tools: Integrated Development Environment (IDE), Apache NetBeans, Eclipse.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

After completion of each module a programming based Assignment/Assessment will be conducted. A scenario will be given to the student to be developed as a Java Application.

Text Book

1) Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill Education.

References

1) Cay S Horstmann and Cary Gornell, "CORE JAVA volume I-Fundamentals", Pearson

2)James W. Cooper, "Java TM Design Patterns – A Tutorial", Addison-Wesley Publishers.

Topics relevant to development of "Employability": Real time application development using OOPs concept. Topics relevant to " PROFESSIONAL ETHICS": Naming and coding convention for Project Development

Catalogue	Ms. Vinitha Dominic
prepared by	Mr. Md Ziaur Rahman
	Mr. Ravindranath R C
	Dr. Malepati Chandra Sekhar
Recommended by the Board of Studies on	BOS NO: 11 th. BOS held on 23/4/21
Date of Approval by the Academic Council	Academic Council Meeting No. 14, Dated 21/5/21

Course Co	de:	Course Title: Pro	ogramming using Python			1	2	2
CSE1002		Type of Course:	School Core Theory & Integrated Lak	ooratory	L- P- C			
Version N	D.	1.0						
Course Pre	9-	Basic knowledge o	of Computers and Mathema	atics				
requisites								
Anti-requi	sites	NIL						
Course De	scription	programming feat develops analytica The associated lab	is course is to enable the st cures and also to familiarize al skills to enhance the prog poratory provides an oppor ity to build real time applic	e the Python I gramming abi tunity to valie	IDLE and of ilities.	her soft	wares. Th	nis course
Course Ou	tcomes	 Summarize the Demonstrate pi Illustrate user-o 	npletion of this course the basic Concepts of python. roficiency in using data stru lefined functions and excep rious python libraries.	ictures.		:0:		
Course Co	ntent:							
Module 1		Basics of Python programming	Assignment	Program	nming		14	Classes
Topics: Da Repetitive		perators and Expre	essions, Input and Outpu	t Statement	s. Control	Structu	res – Sel	ective and
Module 2		Indexed and Associative Data Structures	Simple applications	Program	nming		20	Classes
Topics: Str	ings, Lists,	Sets, Tuples, Dicti	onaries					
Module 3		Functions, Exception handling and libraries	Case study	Program	nming		10 CI	asses
Topics: Us	er defined	functions, except	ion handling, Introductio	on to python	ı built-in li	braries		
List of Lat	ooratory Ta	isks:					0	
		ont Namo					au	LLE NCY UNI
Sl. No.	Experime							
Sl. No.			RS AND EXPRESSIONS				REGISTRA	Registrar

		PROGRAMS ON CONTROL STRUCTURES	
	2	Level - 1 : Basic programs on Control structures	
		Level - 2 : Create applications to solve the real time problems	
		PROGRAMS ON SELECTIVE AND REPETITIVE STRUCTURES	
	3	Level - 1 : Basic programs on Selective and Repetitive structures	
		Level - 2 : Create applications to solve the real time problems	
		PROGRAMS ON STRINGS	
	4	Level - 1 : Basic programs on Strings and its manipulation	
		Level - 2 : Develop Real world applications that involves string matching	
		PROGRAMS ON LISTS, TUPLES and SETS	
	5	Level - 1: Basic programs on lists, Tuples and Sets	
		Level - 2 : Create applications that involves sequential and Random access of data	
		PROGRAMS ON DICTIONARIES	
	6	Level - 1 : Basic programs on dictionaries	
		Level - 2 : Create applications that involves structuring of data.	
		PROGRAMS ON FUNCTIONS	
	7	Level - 1 : Basic programs on Functions	
		Level - 2 : Develop Real world applications using functions	
		PROGRAMS ON EXCEPTION HANDLING	
	8	Level - 1 : Basic programs on exception handling	
		Level - 2 : Develop applications that involves exception handling	
		BASIC PROGRAMS ON BUILT-IN LIBRARIES	
	9	Level - 1 : Basic programs on python modules	
		Level – 2: Develop applications using python libraries	
-			
	_		
	-	Application & Tools that can be used: Application : Web application development, AL Operating systems	
	-	Application : Web application development, AI, Operating systems thon IDLE, ANACONDA	
	-		
		pplication Areas:	
		Veb Development	
		cientific and Numeric Applications	UNIL
		rtificial Intelligence and Machine Learning	strar
		oftware Development	J.
		nterprise-level/Business Applications	

- Education programs and training courses
- Language Development
- Operating Systems
- Web Scrapping Applications
- Image Processing and Graphic Design Applications

Professionally Used Software: Python IDLE, Spyder, Jupyter Notebook, Google Colab

Project work/Assignment:

Project Assignment: Developing python scripts using built in methods and functions

Text Books:

• Charles Dierbach, "Introduction to Computer Science Using Python", Wiley India Edition, 2015.

References:

- 1. E. Balagurusamy, "Introduction to Computing and Problem Solving Using Python", Tata McGraw-Hill, 2016
- 2. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 2017
- 3. Python Tutor Visualize Python, Java, C, C++, JavaScript, TypeScript, and Ruby code execution
- 4. <u>https://practice.geeksforgeeks.org/courses/Python-Foundation</u>

Topics relevant to development of "FOUNDATIONS SKILLS"- Solve the real time problems by analyzing and visualizing the data.

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS"- Data collection and its arrangement

Skill Level: Foundation	n, Skill Development, Employability		
Catalogue prepared by	of. Isaac Joel Raj. S, Ms. GANGA V C, Ms. PALLAVI M, Ms.AKSHATHA Y, Mr.JOBIN THOMAS, Ms. ORNIMA GALIVEETI		
Recommended by the Board of Studies on	BOS NO: 11 th. BOS held on 23/4/21		
Date of Approval by the Academic Council	Academic Council Meeting No. 14, Dated 21/5/21		

Course Code: CSE1003	Course Title: Computer Hardware Workshop		0	2	1	
	Type of Course:1] Program Core 2] Laboratory only	L- P- C				
Version No.	1.0					
Course Pre- requisites	Elements of electrical and electronics engineering (EEE1001)- Basic logic operations, measuring voltages, measuring current, measuring of resistance, series and parallel connections, implementing simple circuits using resistors, capacitors, inductors.					
Anti-requisites	NIL				8ANGALC	

Course	Course description:				
Description	Computer hardware workshop course is designed to train students to identify and handling				
Description					
	the equipment's for assembling computer hardware (SK 6,8). This course will enhance the students attitude of enquiry for trouble shooting (SK 1,4). Students shall be able to learn basics of electrical and electronic components related to hardware and				
	networking system along with installation of operating system. At the end of course students				
	will possess professional & employability skill.				
Course Out	On successful completion of the course the students shall be able to:				
Course Out	On successful completion of the course the students shall be able to:				
Comes	1] Identify electrical and electronic components in computer system.				
	2] Demonstrate assembling of computer hardware.				
	3] Diagnose and resolve of hardware-related problems.				
	4] Installation of different operating system.				
	5] Share the resources and folders over network.				
Course Content:	List of Laboratory Tasks:				
	Experiment No 1 1 Lab Session				
	Implement basic circuit using breadboards and components to measure current and voltage.				
	Level No 01:				
	Implement the given circuit with 3 resistors connected in series with power source of voltage				
	5volts and calculate over all current flowing in this circuit.				
	Level No 02:				
	Implement the given circuit with 3 resistors connected in parallel with power source of voltage				
	5 volts and calculate over all current flow in this circuit.				
	Experiment No 2: 1 Lab Session				
	Perform soldering & de-soldering using discrete components for a specific circuit.				
	Level No 01: Implement the given simple circuits.				
	Level No 02: Implement the given complex circuits.				
	Experiment No 3: 1 Lab Session				
	Identify the computer hardware components				
	Level No. 01: Identify the specific hardware components in desktop system -motherboards				
	components, connectors, slots, ports (USB, VGA, DVI, and HDMI), cables and connectors.				
	Level No. 02: Identify the specific hardware components with specification (Manufacturer,				
	specifications of hardware devices like RAM (Memory), ROM drives graphic cards, sound cards)				
	Experiment No 4: 2 Lab Session				
	Assembling and disassembling the desktop system				
	Level No. 01: Assembling CPU (Processor), RAM (Memory), ROM, Drives, graphic cards, sound				
	cards and connecting with mother board.				
	Level No. 02: Disassembling the desktop system.				
	Experiment No 5: 1 Lab Session				
	To demonstrate BIOS setup program				
	Level No. 01: Learn to use the BIOS SETUP program				
	Level No. 02: Configure the BIOS SETUP for given specification.				
	Experiment No 6: 2 Lab Session				
	Identify the computer hardware problems and trouble shoot.				
	Level No 01: Trouble shoot simple problems – (computer won't turn on, Turns on but still does				
	not work, Screen freezes, CMOS error, Missing operating system, Hard drive not detected)				
	Level No. 02: Trouble shoot complex problems –(Booting infinite, resetting system Mock				
	overheating of PC, dysfunctional of USB port)				
	Experiment No 7: To Install different operating system and drivers 2 Lab Section				
	Experiment No 7: To Install different operating system and drivers 3 Lab Session Level No 01: Partitioning the hard disk and Installation of windows operating system.				
	Level No 01: Partitioning the hard disk and installation of kindows operating system.				
	Level No v2. Partitioning the naru disk and installation of Linux Operating system.				

	Experiment N0 8:		1 Lab Session		
	To share folders and control the resources through ne Level No 01: Sharing of folders, printers and scanners	etwork.	I Lab Session		
Targeted Applica	Level No 02: Granting privileges to access resources. tion & Tools that can be used:				
• • •	ment sector is processor manufacturing and memory c argeted job profiles include hardware engineers and ne	•			
	<u>system information tool</u> . That gives information abou st of <u>hardware</u> and <u>software</u> components.	t design,	portable support		
ASTRA32- is a free of the system.	ee system information tool that shows detail on nume	rous devi	ces and other parts		
Text Book-					
	., IBM PC and Clones Hardware trouble shooting and m	aintenan	ce. McGraw Hill. New		
Delhi,					
Mueller.S, Upgra	ding and repairing PCS, 4th Edition, Prentice Hall.				
	tps://www.cpuid.com/softwares/cpu-z.html tps://www.chtips.com/				
Entrepreneurship:	Students can become entrepreneur in the computer hardware	field.			
Skill Development:	Practical hands on assembling, troubleshooting makes them co	mputer ha	rdware professionals.		
Human Values & I hardware compone	Professional ethics: Set of standard procedures to assemble	and trou	ble shoot the computer		
Catalogue prepared by	Prof. Shanmugharathnam Prof. Mohammed Mujeer ulla Prof. Afroz Pasha Prof. Preeti Prof. Muthupandi				
Recommended by the Board of Studies on	BOS NO: 11 th. BOS held on 23/4/21				
Date of Approval by the Academic Council	Academic Council Meeting No. 14, Dated 21/5/21				
Course Code:	Course Title: Data Structures and Algorithms		anne		
CSE2001	Type of Course: School Core Theory-Integrated Laboratory	L- P- C	2 REGISTRAR		

1.0

Version No.

Course Pre- requisites	Java or Python			
Anti-requisites	NIL			
Course	The purpose of the cour	se is to provide the	fundamental concepts of	data structures and
Description	algorithm, to emphasize th	ne importance of choo	sing an appropriate data str	
-	for program development			
	The student should hav problems.	e basic programmir	ng skills, to solve engine	ering/computational
	•	v provides an opport	unity to implement the co	ncepts and enhance
	critical thinking and analy		, .	·
			concepts of data structure	-
	student can gain practica effective designer, develo	-	ementing them, enabling t	he student to be an
Course	On successful completion			
Outcomes			iven problem using fundam	ental data
	structures.			
			ure for a given computation	
			tructure for a given comput and sorting algorithms.	ation
Course				
Content:				
	Fundamentals of			
	r and annentened b			
Module 1	Data Structure	Assignment	Programming Task	06 Classes
Module 1		Assignment	Programming Task	06 Classes
Topics:	Data Structure (Comprehension)			
Topics: Data Manageme	Data Structure (Comprehension) ent concepts, Data types -	- primitive and non-	primitive, Types of Data S	Structures- Linear &
Topics: Data Manageme Non Linear Data	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R	- primitive and non- ecursive Definitior	primitive, Types of Data S n and Processes, Progra	Structures- Linear &
Topics: Data Manageme Non Linear Data	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving,	- primitive and non- ecursive Definitior	primitive, Types of Data S n and Processes, Progra	Structures- Linear &
Topics: Data Manageme Non Linear Data	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure	- primitive and non- ecursive Definitior	primitive, Types of Data S n and Processes, Progra	Structures- Linear &
Topics: Data Manageme Non Linear Data	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving,	- primitive and non- ecursive Definitior	primitive, Types of Data S n and Processes, Progra	Structures- Linear &
Topics: Data Manageme Non Linear Data Fundamentals of A	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues &	- primitive and non- ecursive Definitior Important Problem ty	primitive, Types of Data S n and Processes, Progra ypes.	Structures- Linear & mming examples.
Topics: Data Manageme Non Linear Data Fundamentals of A Module 2	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues & Linked List	- primitive and non- ecursive Definitior Important Problem ty	primitive, Types of Data S n and Processes, Progra ypes.	Structures- Linear & mming examples.
Topics: Data Manageme Non Linear Data Fundamentals of A Module 2 Topics:	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues & Linked List (Application)	- primitive and non- ecursive Definition Important Problem ty Case Study	primitive, Types of Data S n and Processes, Progra pes. Programming Task	Structures- Linear & mming examples.
Topics: Data Manageme Non Linear Data Fundamentals of A Module 2 Topics: Stack- Concepts	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues & Linked List	- primitive and non- ecursive Definition Important Problem ty Case Study	primitive, Types of Data S n and Processes, Progra pes. Programming Task	Structures- Linear & mming examples.
Topics: Data Manageme Non Linear Data Fundamentals of A Module 2 Topics: Stack- Concepts of Stack.	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues & Linked List (Application) and representation, Stack of	- primitive and non- ecursive Definition Important Problem ty Case Study operations, stack i	primitive, Types of Data S n and Processes, Progra pes. Programming Task mplementation using a	Structures- Linear & mming examples. 08 Classes rray. Applications
Topics: Data Manageme Non Linear Data Fundamentals of A Module 2 Topics: Stack- Concepts of Stack. Queues- Repre	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues & Linked List (Application) and representation, Stack of sentation of queue, Qu	- primitive and non- ecursive Definition Important Problem ty Case Study operations, stack i	primitive, Types of Data S n and Processes, Progra pes. Programming Task mplementation using a	Structures- Linear & mming examples. 08 Classes rray. Applications
Topics: Data Manageme Non Linear Data Fundamentals of A Module 2 Topics: Stack- Concepts of Stack. Queues- Repre of Queue, Appl	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues & Linked List (Application) and representation, Stack of sentation of queue, Que	- primitive and non- ecursive Definition Important Problem ty Case Study operations, stack i eue Operations, Q	primitive, Types of Data S n and Processes, Progra pes. Programming Task mplementation using a	Structures- Linear & mming examples. 08 Classes rray. Applications using array, Types
Topics: Data Manageme Non Linear Data Fundamentals of A Module 2 Topics: Stack- Concepts of Stack. Queues- Repre of Queue, Appl Linked List- Sing	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues & Linked List (Application) and representation, Stack of sentation of queue, Queue ications of Queue. gly Linked List, Operatio	- primitive and non- ecursive Definition Important Problem ty Case Study operations, stack i eue Operations, Q n on linear list usin	primitive, Types of Data S n and Processes, Progra pes. Programming Task mplementation using a	Structures- Linear & mming examples. 08 Classes rray. Applications using array, Types
Topics: Data Manageme Non Linear Data Fundamentals of A Module 2 Topics: Stack- Concepts of Stack. Queues- Repre of Queue, Appl Linked List- Sing	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues & Linked List (Application) and representation, Stack of sentation of queue, Qu lications of Queue. gly Linked List, Operatio cular List, Applications o	- primitive and non- ecursive Definition Important Problem ty Case Study operations, stack i eue Operations, Q n on linear list usin	primitive, Types of Data S n and Processes, Progra pes. Programming Task mplementation using a	Structures- Linear & mming examples. 08 Classes rray. Applications using array, Types
Topics: Data Manageme Non Linear Data Fundamentals of A Module 2 Topics: Stack- Concepts of Stack. Queues- Repre of Queue, Appl Linked List- Sing Linked List, Circ	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues & Linked List (Application) and representation, Stack of sentation of queue, Qu lications of Queue. gly Linked List, Operatio cular List, Applications of Non-linear Data	- primitive and non- ecursive Definition Important Problem ty Case Study operations, stack i eue Operations, Q n on linear list usin f Linked list.	primitive, Types of Data S n and Processes, Progra pes. Programming Task mplementation using a queue implementation using a	Structures- Linear & mming examples. 08 Classes array. Applications using array, Types structures, Doubly
Topics: Data Manageme Non Linear Data Fundamentals of A Module 2 Topics: Stack- Concepts of Stack. Queues- Repre of Queue, Appl Linked List- Sing	Data Structure (Comprehension) ent concepts, Data types - Structures. Recursion: R Algorithmic problem solving, Linear Data Structure Stack, Queues & Linked List (Application) and representation, Stack of sentation of queue, Qu lications of Queue. gly Linked List, Operatio cular List, Applications o	- primitive and non- ecursive Definition Important Problem ty Case Study operations, stack i eue Operations, Q n on linear list usin	primitive, Types of Data S n and Processes, Progra pes. Programming Task mplementation using a	Structures- Linear & mming examples. 08 Classes rray. Applications using array, Types

Topics:

Introduction to Trees, Binary tree: Terminology and Properties, Binary tree traversals: Pre-Order traversal, In-Order traversal, Post-Order traversal.

Module-4	Non-linear	Data	Assignment	Programming Task	03 Classes
	Structures	–Graphs			
	(Comprehen:	sion)			

Topics:

Graph – Basic Concept of Graph Theory and its Properties, Representation Of Graphs.

Module-5	Searching & Sorting	Assignment	Programming Task	06 Classes
	Performance Analysis			
	and Management			
	(Comprehension)			

Topics:

Sorting & Searching: Performance Analysis and Management - Time and space analysis of algorithms – Average, best and worst case analysis. Searching – Sequential Search and Binary Search, Sorting – Bubble Sort, Selection Sort.

List of Laboratory Tasks:

Lab sheet 1:	[02 Classes]
To implement the Programs on User define functions	
Level 1: Implement a program to compute factorial using functions. Level 2: Implement a program to pass array to a function and manipulate the data in array.	
Lab sheet 2:	[02 Classes]
To implement the Programs on User define functions	
Level 1: Implement a program to compute factorial using recursion. Level 2: Implement a program to solve towers of Hanoi using recursion.	
Lab sheet 3:	[04 Classes]
To implement the Programs on Stack.	
Level 1: Implement the operations of the Stack. Level 2: Implement the evaluation of postfix expression	
Lab sheet 4:	[04 Ciasses]
To implement the programs on Queue.	* BAMONIC

Level 1: Implement all the operations of the Queue

Level 2: Issuing to	oken for doctor appointment.
Lab sheet 5:	[06 Classes]
To implement the	Programs on Linked List.
	nt all the operations of the Singly Linked List nt Stack and Queue with Linked List.
Lab sheet 6:	[04 Classes]
To implement the	ne Programs on Trees and Traversals
Level 1: Implement Level 2: Implement	nt construction of the Binary tree. nt tree traversals.
	lement the Programs on Graphs. to implement graph
Level 1: Program	[6 Classes] omplexity and implement the Programs on searching and sorting. on searching and sorting. lyze the time complexity.
Professionally U Project work/As 1. Problem	re and Application software Programming Jsed Software : Eclipse / Jupyter notebook IDE ssignment: n Solving: Choose an appropriate data structure and implementation of programs. nming: Implementation of given scenario using Java or python
	rerials: Text Book(s):
	atesan, S. Lovelyn Rose, "Data Structures" Wiley, Second edition, January 2019.
2. Anany Le	evitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education.
Heidelberg, 2008 2. Thomas H.Co	rn, and Peter Sanders – Algorithms and Data Sturctures The Basic Toolbox, Springer-Verlag Berlin 8. ormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to II Learning Private Limited.
	to development of "Foundation Skills": Fundamentals of Data structure, "Skill
	- Implementation Linear and nonlinear data structure, "Employability" -Linear & Nonlinear
Catalogue prepared by	Dr. Nagaraja S R Mr. Asif Mohamed H B Mr. Amogh Pramod Kulkarni Mrs. Yashaswini K A

	Dr. Mahalakshmi R
Recommended	BOS NO: 11 th. BOS held on 23/4/21
by the Board of	
Studies on	
Date of	Academic Council Meeting No. 14, Dated 21/5/21
Approval by the	
Academic	
Council	

Course Code: CSE2006	Course Title: Data Stru	ctures					
	Type of Course: Progra			L- P- C	2	4	4
	Theory-Integrated Labo	oratory					
Version No.	1.0						
Course Pre- requisites	Introduction to Programm	ning					
Anti-requisites	NIL						
Course Description	The purpose of the cour emphasize the importance development. The associated laborator critical thinking and analy With a good knowledge in in implementing them, to applications.	e of choosing an appro ry provides an opport /tical skills. n the fundamental con	priate data struunity to imple cepts of data st	ment the muctures a	d techni concep and prac	que for p ts and e tical exp	rogram nhance erience
Course Outcomes	structures such as a 2. Apply an approp 3. Apply an approp	ularized solutions for g	iven problem u ure for a given tructure for a g	sing fund computat iven com	ion. outatior		
Course Content:							
Module 1	Fundamentals of Data Structure (Comprehension)	Assignment	Programmi	ng Task		10	Hours
Non Linear Data	ent concepts, Data types Structures. Recursion: I ntages, Disadvantages,	Recursive Definition	•••				
Module 2	Linear Data Structure Stack, Queues (Application)	Assignment	Programmi	ng Task		KE6 HQ	UIS Regis

Topics:

Stack- Concepts and representation, Stack operations, stack implementation using array. Applications of Stack.

Queues- Representation of queue, Queue Operations, Queue implementation using array, Types of Queue, Applications of Queue.

Module 3 (Application)	Assignment	Programming Task	08 Hours
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Topics:

Linked List- Singly Linked List, Operation on linear list using singly linked storage structures, Doubly Linked List, Circular List, Applications of Linked list.

Module 4	Non-linear Data Structures – Trees (Application)	Assignment	Programming Task	06 Hours
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Topics:

Introduction to Trees, Binary tree: Terminology and Properties, Binary tree traversals: Pre-Order traversal, In-Order traversal, Post-Order traversal. Binary Search tree: Operations in BST.

,	,	, ,		-
Module-5	Non-linear Data	Assignment	Programming Task	06 Hours
	Structures – Graphs			
	(Comprehension)			

Topics:

Graph – Basic Concept of Graph Theory and its Properties, Representation Of Graphs, Elementary Graph operations, Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree.

List of Laboratory Tasks:

Lab sheet 1:

To implement the Programs on Fundamentals of Programming. Basic Programs

Level 1:

a) Prompt the user, read input and print messages

- b) Programs using operators and conditional statements
- c) Calculate simple interest

d) Perform swapping of numbers

Level 2: Write programs to solve various patterns.

Lab sheet 02:

To implement the Programs on User define functions

Level 1: Implement a program to compute factorial using functions. Level 2: Implement a program to pass array to a function and manipulate the data in array.



[6 Hours]

Lab sheet 03:	[02 Hours]
To implement the Programs on User define functions	
Level 1: Implement a program to compute factorial using recursion. Level 2: Implement a program to solve towers of Hanoi using recursion.	
Lab sheet 04:	[04 Hours]
To implement the Programs on pointers and Dynamic Memory Allocation	
Level 1: Implement a program to use pointers, pointer to array, pointer to function, use dynamic memorLevel 2: a) Implement a simple banking program using pointers.a) Implement a program to prepare grocery list that vary every month.	y allocation.
Lab sheet 05:	[08 Hours]
To implement the Programs on Abstract Data Type and user defined data type.	
Level 1: Implement a program to read details of the students and use typedef. Level 2: Implement a program to read array of type Student and perform required operation. Implement a program to represent, read and add complex numbers.	
To implement the Programs on Union and Enumeration.	
Level 1: Implement a program on Lucky Dip Activity using Union Level 2: Use enumeration to define various prizes to the Level 1 activity.	
Lab sheet 06:	[06 Hours]
To implement the Programs on Stack.	
Level 1: Implement the operations of the Stack using array. Level 2: Implement the operations of stack using structure.	
Lab sheet 07:	[06 Hours]
To implement the application of Stack.	
Level 1: Implement program to verify the balance of parenthesis.Level 2: a) Implement the conversion of infix to postfix expression.b) Implement the evaluation of postfix expression	
Lab sheet 08:	[06 Hours]
To implement the programs on Queue.	- eren
Level 1: Implement all the operations of the Queue Level 2: Implement all the operations of the Circular Queue. Issuing token for doctor appointment.	REGISTRAR
Lab sheet 09:	[08 Hours]

To implement the Programs on Linked List.	
Level 1: Implement all the operations of the Singly Linked List Level 2: Implement Stack and Queue with Linked List.	
Lab sheet 10:	[08 Hours]
To implement the Programs on Linked List.	
Level 1: Implement all the operations of the Doubly Linked List. Level 2: Implement all the operations of the Circular Linked List.	
Lab sheet 11:	[08 Hours]
To implement the Programs on Trees and Traversals	
Level 1: Implement the operations of the Binary tree. Level 2: Implement the operations of the Binary search tree and the tree traversals.	
Lab sheet 12: To study and implement the Programs on Graphs. Level 1: Program to implement graph Level 2: Implement Depth first & breadth first search	[6 Hours]
Targeted Application & Tools that can be used: System software and Application software Programming Professionally Used Software : MinGW / C/C++ IDE	
Targeted Application & Tools that can be used: System software and Application software Programming Professionally Used Software : MinGW / C/C++ IDE Project work/Assignment:	ntation of programs
Targeted Application & Tools that can be used: System software and Application software Programming	ntation of programs.
Targeted Application & Tools that can be used: System software and Application software Programming Professionally Used Software : MinGW / C/C++ IDE Project work/Assignment: 3. Problem Solving: Choose an appropriate data structure and impleme	ntation of programs.
 Targeted Application & Tools that can be used: System software and Application software Programming Professionally Used Software : MinGW / C/C++ IDE Project work/Assignment: Problem Solving: Choose an appropriate data structure and impleme Programming: Implementation of given scenario using C or C++. 	
Targeted Application & Tools that can be used: System software and Application software Programming Professionally Used Software : MinGW / C/C++ IDE Project work/Assignment: 3. Problem Solving: Choose an appropriate data structure and impleme 4. Programming: Implementation of given scenario using C or C++. REFERENCE MATERIALS: Text Book(s):	n, January 2019.
 Targeted Application & Tools that can be used: System software and Application software Programming Professionally Used Software : MinGW / C/C++ IDE Project work/Assignment: Problem Solving: Choose an appropriate data structure and impleme Programming: Implementation of given scenario using C or C++. REFERENCE MATERIALS: Text Book(s): R. Venkatesan, S. Lovelyn Rose, "Data Structures" Wiley, Second editio Seymour Lipschutz, "Data Structures with C" (Schaum's Outline Series) I July 2017 	n, January 2019. McGraw Hill Education,
 Targeted Application & Tools that can be used: System software and Application software Programming Professionally Used Software : MinGW / C/C++ IDE Project work/Assignment: Problem Solving: Choose an appropriate data structure and impleme Programming: Implementation of given scenario using C or C++. REFERENCE MATERIALS: Text Book(s): R. Venkatesan, S. Lovelyn Rose, "Data Structures" Wiley, Second edition Seymour Lipschutz, "Data Structures with C" (Schaum's Outline Series) I July 2017 References Robert L Kruse, Bruce P Leung and Clovis L Tondo, "Data Structures and ProPearson. 	n, January 2019. McGraw Hill Education, gram Design in C",
 Targeted Application & Tools that can be used: System software and Application software Programming Professionally Used Software : MinGW / C/C++ IDE Project work/Assignment: Problem Solving: Choose an appropriate data structure and impleme Programming: Implementation of given scenario using C or C++. REFERENCE MATERIALS: Text Book(s): R. Venkatesan, S. Lovelyn Rose, "Data Structures" Wiley, Second edition Seymour Lipschutz, "Data Structures with C" (Schaum's Outline Series) I July 2017 References Robert L Kruse, Bruce P Leung and Clovis L Tondo, "Data Structures and Propriot 	n, January 2019. McGraw Hill Education, gram Design in C",

Catalogue	Dr. Nagaraja S R
prepared by	Asst.Professor, Dept of CSE
	Dr. Blessed Prince P
	Associate Professor, CSE
Recommended	BOS NO: 11 th. BOS held on 23/4/21
by the Board of	
Studies on	
Date of	Academic Council Meeting No. 14, Dated 21/5/21
Approval by the	
Academic	
Council	

Course Code:	Course Title: Design and Analysis of Algorithms					
CSE2007	Type of Course:1] Program Core 2] Theory – Laboratory integrated	L-P-C	2	2	3	
Version No.	2.0					
Course Pre- requisites	 C programming Discrete mathematics. Data structure. 					
Anti-requisites	Nil					
Course Description	The main goal of this course is to study the fundamental techniques to design and analyze the efficient of algorithms and their running time. After a brief review of prerequisite material (search, sorting, asymptotic notation), solving various real time problems through various algorithmic techniques such as divide and conquer algorithms, dynamic programming, greedy algorithm etc.					
Course Out Comes	On successful completion of the course the students shall be able to:					
comes	1) Analyze the asymptotic performance of algorithms.					
	2) Analyze the time and space complexity of an algorithm.					
	3) Apply the different techniques of algorithm in solving real world problems.					
	 Summarize the performance of various real different algorithmic techniques. 	time proble	ems usin	g		
			0	anne		

Module 1	Design of basic Tree and Graph problems	Assignment	Problem Solving	08 Hours
Topics:				
Fundamentals of	Algorithmic Probl	em Solving, Important I	Problem Types-Sorting, Searching	, String
Processing, Graph	Problems, Comb	inatorial Problems, Fu	ndamental Data Structures -Line	ar Data
Structures, Graphs	, Trees, Sets and Di	ctionaries. [Blooms 'level	selected: C omprehension]	
	Analysis of			
Module 2	Recursive and	Term	Programming/ Problem Solving	06Ho
	Non-recursive	paper/Assignment	Programming/ Problem Solving	urs
	algorithms			
Topics:			·	
Algorithm Design p	aradigms - motivat	ion, concept of algorithmic	c efficiency, run time analysis of algo	orithms,
Asymptotic Notatio	ons. Recurrences- s	ubstitution method. [Bloo	ms 'level selected: Comprehension]
Madula 2	Divide-and-	Term paper		06
Module 3	conquer	/Assignment	Programming/Problem Solving	Hours
			search, quick sort, Merge sort, Bina ooms 'level selected: Application]	.,
	,	Tauna manan		00115
Module 4	Algorithms and	Term paper	Problem Solving	08Ho
	Dynamic	/Assignment		urs
	Programming			
Dynamic Programi The Knapsack Prol problem.	<ruskal's algorithm,<br="">ming :</ruskal's>	, Dijkstra's Algorithm. efficient, Warshall's and F	iloyd's Algorithms, Travelling sales	person
	Backtracking	Term paper		06Ho
Module 5	and Limitations	Term paper /Assignment	Problem Solving	urs
	of Algorithm	Assignment		
Backtracking – n-Q Problems,	ueens problem. <u>Lo</u>	wer-Bound Arguments, D	ecision Trees, P , NP , and NP-Co	omplete
	elected Compre	hension]		
[Blooms 'level s	selected. Comple			
[Blooms 'level s			Sa	WILL ENCY

Experiment No. 2: Apply Brute force algorithmic designing technique to sort elements using selection algorithm and calculate time (Best, average & worst) efficiency. .[**2 hours : Application Level**]

Level 1: understanding and designing the algorithm.

Level 2: Implementing the algorithm and finding its efficiency.

Experiment No. 3: Apply divide and conquer algorithmic designing technique to sort elements using merge sort algorithm and calculate time (Best, average & worst) efficiency. [2 hours : Application Level]

Level 1: Understanding merge sort using divide and conquer and designing the algorithm. Level 2: Implementing the algorithm and finding its efficiency.

Experiment No. 4: Apply dynamic programming algorithmic designing technique to find binomial coefficient of a given number i.e nCr and calculate time (Best, average & worst) efficiency [2 hours : Application Level] Level 1: understanding dynamic problem, solve nCr problem and designing the algorithm. Level 2: Implementing the algorithm and finding its efficiency.

Experiment No. 5: Apply dynamic programming algorithmic designing technique to find All pair Shortest Path for a given graph using Warshall's and Floyd's algorithm **[2 hours : Application Level]**

Level 1: understanding and designing the algorithm. Level 2: Implementing the algorithm and finding its efficiency.

Experiment No.6: Apply dynamic programming algorithmic designing technique for Solving 0/1 knapsack problem and find its efficiency [2 hours : Application Level]

Level 1: understanding and designing the algorithm. Level 2: Implementing the algorithm and finding its efficiency.

Experiment No. 7 Apply greedy algorithmic designing technique for Solving MST and single source shortest path problem by using – Dijkstra's algorithm [**2 hours : Application Level**]

Level 1: understanding and designing the algorithm.

Level 2: Implementing the algorithm and finding its efficiency.

Experiment No. 8: Apply greedy algorithmic designing technique for constructing minimum spanning tree using prim's algorithm and Kruskal's algorithm **[2 hours : Application Level]**

Level 1: understanding and designing the algorithm.

Level 2: Implementing the algorithm and finding its efficiency.

Experiment No. 9: Apply backtracking algorithmic designing technique for solving queen's problems for 4.8 and inputs. **[2 hours : Application Level]**

Level 1: understanding and designing the algorithm. Level 2: Implementing the algorithm and finding its efficiency. Targeted Application & Tools that can be used:

Application Area is to Design and Analyzing the efficiency of Algorithms. Tools/Simulator used: GCC compiler.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

- 5. Problem Solving: Design of Algorithms and implementation of programs.
- 6. Programming: Implementation of given scenario using C.

Text Book

1.Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to*

Algorithms", PHI Learning Private Limited.

References

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education.

Topics relevant to development of "Foundation, skill Development, Employability": Asymptotic Notations, Order of growth, P,NP Problems.

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS": Solving real time Problems & Data collection for an assignment.

Catalogue prepared by	Dr.A.Jayachandran, Mr. Sunil Kumar R.M, Mr.Mrutunjaya, Mrs Preethi, Mrs Prakruthi,Mrs Smitha patil
Recommended by	Mention the BOS Number and the Date of BOS
the Board of	
Studies on	
Date of Approval	Mention the Academic Council Meeting
by the Academic	No. & the date of the meeting:
Council	Ŭ

Course Code: CSE2008	Course Title: Programming in Java (Object Oriented Programming)		1	4	3	
	Type of Course: Program Core Theory and Laboratory Integrated	L-P-C	REG	STRAR	Registra	A PERSON A
Version No.	1.0					

Course Pre- requisites	Basic knowledge of any structured programming: Data types, variables, constants, operators, conditional & control structures, Loops, arrays & function.					
Anti-requisites	NIL	NIL				
Course Description	This course introduces the core concepts of object-oriented programming by using Java. This course has theory and lab component which emphasizes on understanding the implementation and application of object-oriented programming paradigm. It helps the student to build real time secure applications by applying these concepts and also for effective problem solving. The students interpret and understand the need for object oriented programming to build applications					
Course Out Comes	 On successful completion of the course the students shall be able to: 1) Write programs using basic concepts in JAVA 2) Apply the concept of arrays, strings, polymorphism & inheritance for building deskto 3) Implement interface & packages for building secure applications 4) Apply the concepts of error handling mechanism and multithreading. 5) Apply the concepts of Collections to develop high performance applications. 			g desktop		
Content:						
Module 1	INTRODUCTION	Assignment	Programming	No. of Classes: 10		

Topics: Introduction to Object Oriented Programming, Java Evolution, and How Java differs from C++, Features of Java,

Java Environment: Installing JDK (JVM, JRE), Java Source File Structure, Compilation and Execution of Java Programs.

TOKENS: Data types, Variables, Operators, Control Statements, Command Line Arguments.

CLASSES, OBJECTS, AND METHODS: Defining a class, access specifiers, instantiating objects, reference variable, accessing class members and methods, constructors, method overloading, static members, static methods, inner class, Wrapper class, Autoboxing and Unboxing,

Arrays, Strings, inheritance	/loquie z		Assignment	Programming	No. o Classes	
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Topics:Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array.

Operation on String, Mutable & Immutable String, Creating Strings using StringBuffer or StringBuilder.

Defining a subclass, types of Inheritance, method overriding, super keyword, dynamic method invocation, dynamic polymorphism, usage of final abstract and this keyword.

Module 3Interfaces, Fackages and Exception HandlingAssignmentProgramming	Programming	Assignment	Interfaces, Packages and Exception Handling	Module 3
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Topics:Defining interfaces, extending an interface, Implementing interfaces. Organizing Classes and Interfaces in Packages, Package as Access Protection, Defining a Package, Library Packages, import packages.

Exception handling: Introduction to Exceptions, Difference between Exceptions & Errors, Types of Exception. Handling Exceptions: Use of try, catch, finally, throw, throws. User Defined Exceptions, Checked and Un-Checked Exceptions.

	MULTITHREADED			No. of	
Module 4	PROGRAMMING:	Assignment	Programming	Classes:	
	PROGRAMMING.			12	

Topics: Introduction to threads, life cycle of a thread, creating threads, extending the Thread Class, Implementing the "runnable" interface. Thread Priority, Thread synchronization, Inter communication of Threads

	Collections and Graphic			No. of
Module 5	Programming(AWT,Swings)	Assignment	Mini Project	Classes:
	Programming(Avvr,Swings)			12

Introduction to Collections, Classification of Collection. Introduction to List, Map and Set Interface, Introduction to Applets.

Introduction to the abstract window toolkit (AWT), Frames, Event-driven programming: Mouse and Key Event handling. Introduction to Swings, JFC, Swing GUI Components and Layout Manager.

List of Laboratory Tasks:

Experiment N0 1: Programming assignment with class, objects and basic control structures. (Application: Build a basic menu driven application)

Level 1: Programming scenarios which use control structures to solve simple case scenarios (Eg: Check if a number is odd or even)

Level 2: Programming assignment which will build menu driven application by identifying the class and its relevant methods.

Experiment No. 2: Programming assignment using Arrays and Strings. (Application: Develop application on Matrices, build String based application like Telephone directory)

Level 1: Programming scenarios which build single dimensional and multidimensional array, apply the different methods to operate on strings.

Level 2: Programming assignment which will manipulate the data stored in matrices and identify the appropriate usage String methods.

Experiment No. 3: Programming assignment using Inheritance and Polymorphism

Level 1: Programming scenarios which use the concept the polymorphism for method overloading. Scenarios which apply the concept of inheritance (identifying parent, child class and its relations)

Level 2: Programming assignment which build application which have same functions in different forms

Experiment No. 4: Programming assignment using Exception Handling

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Level 1: Programming assignment on building applications using built in Exceptions.

Level 2: Programming assignment on building application using user defined Exceptions.

Experiment No. 5: Programming assignment using Multithreading. (Eg: Building an application which performs different arithmetic operations and sharing the resources using threads)

Level 1: Programming scenarios to build a thread, assign priority and use the thread methods to perform operations

Level 2: Programming scenarios for building synchronized applications.

Experiment No. 8: Programming assignment using Collections

Level 1: Programming Scenarios to apply and use the Collection framework (List, SET, Map, Interface)

Experiment No. 9: Programming assignment to build GUI Applications.

Level 1: Programming Scenarios to build GUI for a given scenario using AWT and Swings concepts.

Targeted Application & Tools that can be used:

- Platform independent Application Development
- Secure Application Development
- Data Mining
- Operating Systems.
- Database Management Systems
- Banking software
- Automobiles
- Mobile Applications

Tools: JDK (Java Development Tool kit), Integrated Development Environment (IDE), Apache NetBeans, Eclipse.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

After completion of each module a programming based Assignment/Assessment will be conducted. A scenario will be given to the student to be developed as a Java Application. On completion of Module 5, student will, be asked to develop a Mini Project using the GLU functionalities

On completion of Module 5, student will be asked to develop a Mini Project using the GUI functionalities.

Text Book

1) Cay S Horstmann and Cary Gornell, *"CORE JAVA volume I-Fundamentals"*, Pearson.

2) Cay S Horstmann and Cary Gornell, "CORE JAVA volume II-Advanced Features", Pearson.

References

1)Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill Education.

2)James W. Cooper, "Java TM Design Patterns – A Tutorial", Addison-Wesley Publishers.

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Topics relevant to	development of "Employability": Real time application development using OOPs concept.
•	• "HPROFESSIONAL ETHICS": Naming and coding convention for Project Development
Catalogue prepared by	Ms. Vinitha Dominic
Recommended by the Board of Studies on	BOS NO: 11 th. BOS held on 23/4/21
Date of Approval by the Academic Council	Academic Council Meeting No. 14, Dated 21/5/21

Course Code: CSE 2009	Course Title: Compute Type of Course: Progr	-		L- P- C	3	0	3
Version No.	1.0						
Course Pre- requisites	Digital Design Basic concepts of nun	nber systems, logic	gates, basic arithmet	ic operatio	ns		
Anti-requisites	NIL						
Course Description	This course introduces the to intermediate level. The between computer hard assembly-level instruction concepts of computer te	his theory based coudware and software. Son set architectures. Achnology as well as p	rse emphasizes on und It equips the students It helps the students to performance enhancem	derstanding with the in p interpret t ent.	the ntu	e inte ition	raction behind
Course Outcomes Course Content:	On successful completio 1] Describe the basic co architecture 2] Apply appropriate teo 3] Explain the organizati	omponents of a com hniques to carry out	puter, their interconne selected arithmetic ope	ections, and	ins	struct	ion set
Module 1	Basic Structure of computers	Assignment	Data Analysis tas	k		9 C	lasses
Topics: Functional Units, I Module 2	Basic Operational conce Instruction Set Architecture and I/O	ots, Bus Structures, Assignment	Performance, Genera Analysis, Data C		mp		s.
	Unit	Assignment				0	للللل
Topics: Instruction Set Arch	nitecture: Instructions type	es and Instruction Se	quencing. Instruction fo	ormats. Add	rel	T	131

Input/output Design: Accessing I/O Devices, I/O communication, Interrupts, DMA.

Module 3	Arithmetic and	Case Study	Data analysis task	9 Classes
	Memory unit	·		
Fopics:				
•	dders, Signed-Operand N	Aultiplication, Fast Mu	ultiplication, Integer Division,	and Floating
point operations.				
	•	l Organization of Men	nory chips, Read Only Memo	ries, Memory
Hierarchy, Cache	Memories.			
Module 4	BPU and Pipelining	Assignment	Analysis, Data Collection	10 Classes
Widdule 4			Analysis, Data collection	IU Classes
Toulou				
Topics: Basic Processing II	Init: Fundamental Concents	Single Bus organization	n, Control sequence, Execution	of a Complete
-	le Bus Organization.	, single bus organization	i, control sequence, Execution	
Pipelining: Overvie	w of pipelining, 5 stage inst	ruction pipeline, Hazards	i.	
Targeted Applica	ation & Tools that can be	used		
		useu.		
Targeted employ	ment sector is processor	manufacturing and me	emory chip fabrication vendo	rs like Intel,
AMD, Motorola,	NVidia, Samsung, Micron	Technology, western	Digital etc. Targeted job profi	les include
•	•	gineers, Physical syste	m design engineer, System pr	ogrammer,
Fabrication engin	ieer etc.			
Tools:				
 Simplesc 	alar/Simwatch			
•	alar/Simwatch for the Intel 80X86 family	y of computer archited	ture	
EasyCPU	alar/Simwatch for the Intel 80X86 family data-path simulator for a		ture	
EasyCPURTLsim a	for the Intel 80X86 family	a MIPs like CPU	ture	
EasyCPURTLsim aRISC-V for	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo	a MIPs like CPU	ture	
EasyCPURTLsim aRISC-V for	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo	a MIPs like CPU	ture	
 EasyCPU RTLsim a RISC-V fo Project work/Ass	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo	a MIPs like CPU	ture	
 EasyCPU RTLsim a RISC-V fo Project work/Ass	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo	a MIPs like CPU	ture	
 EasyCPU RTLsim a RISC-V fo Project work/Ass Mini Project:	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo signment:	a MIPs like CPU rs	ture nory hierarchy having a layer	ed cache with
 EasyCPU RTLsim a RISC-V fo Project work/Ass Mini Project: Model a 	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo signment:	a MIPs like CPU rs with the standard mer	nory hierarchy having a layer	ed cache with
 EasyCPU RTLsim a RISC-V fo Project work/Ass Mini Project: Model a 	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo signment: virtual computer system	a MIPs like CPU rs with the standard mer	nory hierarchy having a layer	ed cache with
 EasyCPU RTLsim a RISC-V fo Project work/Ass Mini Project: Model a branch p 	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo signment: virtual computer system redictors and cache repla	a MIPs like CPU rs with the standard mer	nory hierarchy having a layer	ed cache with
 EasyCPU RTLsim a RISC-V fo Project work/Ass Mini Project: Model a branch p 	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo signment: virtual computer system redictors and cache repla	a MIPs like CPU rs with the standard mer	nory hierarchy having a layer	ed cache with
 EasyCPU RTLsim a RISC-V fo Project work/Ass Mini Project: Model a branch p Term Assignmen	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo signment: virtual computer system redictors and cache repla	a MIPs like CPU rs with the standard mer cement/insertion poli	nory hierarchy having a layer cies	(anne
 EasyCPU RTLsim a RISC-V fo Project work/Ass Mini Project: Model a branch p Term Assignmen	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo signment: virtual computer system redictors and cache repla	a MIPs like CPU rs with the standard mer cement/insertion poli	nory hierarchy having a layer cies A) of CISC and RISC processo	rs aume
 EasyCPU RTLsim a RISC-V fo Project work/Ass Mini Project: Model a branch p Term Assignmen Compara 	for the Intel 80X86 family data-path simulator for a or ARM like RISC processo signment: virtual computer system redictors and cache repla	a MIPs like CPU rs with the standard mer icement/insertion polic	nory hierarchy having a layer cies A) of CISC and RISC processo	rs auna REGISTRAR

RISC architectures including DEC Alpha, ARC, AMD 29k, Atmel AVR, Intel i860, Blackfin, i960, Motorola 88000, MIPS, PA-RISC, Power, SPARC, SuperH, and ARM too.

• A short survey of the recent trends in the Cache memory design

Study and analyze few important present day cache memory design issues like the levels used, the mapping technique employed, read and write policies, coherency scenarios etc.

Text Book

- 1. "Computer Organization"- Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Fifth Edition, McGraw-Hill Higher Education, 20016 reprint.
- 2. "Computer Organization and Design The Hardware/Software Interface" David A. Patterson & John L. Hennessy, Fifth Edition, Morgan Kaufmann, Elsevier Publications, 2017.

References

1. "Computer Organization & Architecture – Designing for Performance" - William Stallings, 9th Edition, Prentice Hall, Pearson Education Inc., 2015

Topics relevant to development of "FOUNDATION SKILLS": Generation of Computers, CISC and RISC processors, Bus Arbitration.

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS": Collaboration and Data collection for Term assignments and Case Studies.

Catalogue prepared by	Prof. Tapas Guha, Dr. K.G. Mohan, Prof. Srivinay
Recommended by the Board of Studies on	BOS NO: 12 th BOS, held on XX/XX/XX
Date of Approval by the Academic Council	Academic Council Meeting No. 14, Dated XX/XX/XX

Course Code:	Course Title: Operating Systems		3	0	3
CSE2010	Type of Course: Program Core and Theory Only	L- P- C			
Version No.	1.0				
Course Pre- requisites	 [1] Programming fundamentals: Pseudocode, Data Type Control Structures, Functions, Loops, Arrays, Structures [2] C programming syntax and semantics [3] Data Structures: pointers, stacks, queues, linked lists 	5.	rators, S	Selectio	n
Anti-requisites	NIL				
Course Description	The purpose of this course is to enable the students to under systems and to develop the basic concepts of process mana memory management. The course is both conceptual and a Managing the Process and Memory and needs fair knowled C programming and data structures. The course develops the skills on allocating and managing resources. The course also and systems programming abilities through assignments.	gement, Sy nalytical in ge of progr e critical th	nchroni nature t amming iinking a	zation a owards fundam nd analy	tical

Course Out		-	students shall be able to:	
Comes	_	ndamental concepts of Op on various CPU Schedulir		
			s synchronization problems.	
		memory management te		
Course Conten		, ,	· ·	
Module 1	Introduction	Assignment	Programming/Data Collection	9 Hours
Topics:				
			rating System Structure, Operations	
-	-		ronments, Operating System Service	
	• •	pes, System Programs	[loaders, linkers], Overview of OS	design and
implementatio	II.	Coding		
Module 2	Process	Assignment/Case	Pseudocode/Programming	9 Hours
Would'e 2	Management	Study	r seddocode/r rogramming	Jilouis
Topics:				
•	pt, Operations on P	Processes, Inter Proce	ss Communication, Introduction to	o threads ·
			ots, Scheduling Criteria, Scheduling	
-		vel Queue, Multilevel F		C
	Process	Coding		
Module 3	Synchronization	Assignment/Case	Pseudocode/Programming	9 Hours
		Study		J Hours
	and Deadlocks	Study		5 110013
		Study		
		Study		
Topics:	and Deadlocks			
Topics: The Critical-Sec	and Deadlocks	son's Solution, Synchro	onization hardware, Mutex locks, S	emaphores
Topics: The Critical-Sec Monitors, Clas	and Deadlocks ction Problem- Peters sical Problems of Syr	son's Solution, Synchronchronization. Introdu	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara	emaphores
Topics: The Critical-See Monitors, Clas Methods for ha	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea	son's Solution, Synchronchronization. Introdu	onization hardware, Mutex locks, S	emaphores
Topics: The Critical-See Monitors, Clas Methods for ha	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea	son's Solution, Synchronchronization. Introdu	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara	emaphores, acterization,
Topics: The Critical-See Monitors, Clas Methods for ha from Deadlock	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea	son's Solution, Synchronchronization. Introduc dlock Prevention- Deac	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara llock Avoidance- Deadlock detection	emaphores, acterization, & Recovery
Topics: The Critical-Se Monitors, Clas Methods for ha from Deadlock	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea Memory	son's Solution, Synchronchronization. Introdu	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara	emaphores
Topics: The Critical-Se Monitors, Clas Methods for ha from Deadlock	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea	son's Solution, Synchronchronization. Introduced dlock Prevention- Deaced Assignment/Case	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara llock Avoidance- Deadlock detection Programming/Simulation/Data	emaphores acterization & Recovery
Topics: The Critical-Sec Monitors, Clas Methods for ha from Deadlock Module 4	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea Memory	son's Solution, Synchronchronization. Introduced dlock Prevention- Deaced Assignment/Case	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara llock Avoidance- Deadlock detection Programming/Simulation/Data	emaphores acterization & Recover
Topics: The Critical-Sec Monitors, Clas Methods for ha from Deadlock Module 4 Topics:	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea Memory Management	son's Solution, Synchronchronization. Introduced dlock Prevention- Deaced Assignment/Case Study	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara llock Avoidance- Deadlock detection Programming/Simulation/Data	emaphores acterization & Recover 9 Hour
Topics: The Critical-Sec Monitors, Clas Methods for ha from Deadlock Module 4 Topics: Introduction, S	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea Memory Management	son's Solution, Synchronchronization. Introduction dlock Prevention- Deace Assignment/Case Study	Donization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara llock Avoidance- Deadlock detection Programming/Simulation/Data Collection	emaphores acterization & Recovern 9 Hour s
Topics: The Critical-Sec Monitors, Clas Methods for ha from Deadlock Module 4 Topics: Introduction, S Structure of the	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea Memory Management Swapping, Contiguou e Page Table – Demar	son's Solution, Synchronchronization. Introduction dlock Prevention- Deace Assignment/Case Study	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara llock Avoidance- Deadlock detection Programming/Simulation/Data Collection	emaphores acterization & Recovery 9 Hour s
Topics: The Critical-See Monitors, Clas Methods for ha from Deadlock Module 4 Topics: Introduction, S Structure of the Targeted Appli	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea Memory Management Swapping, Contiguou e Page Table – Demar	son's Solution, Synchronchronization. Introduction dlock Prevention- Deace Assignment/Case Study	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara llock Avoidance- Deadlock detection Programming/Simulation/Data Collection s Memory Allocation, Segmentation cement, Allocation of Frames – Thra	emaphores acterization & Recovery 9 Hours on, Paging shing.
Topics: The Critical-See Monitors, Clas Methods for ha from Deadlock Module 4 Topics: Introduction, S Structure of the Targeted Appli Real time Appl	and Deadlocks ction Problem- Peters sical Problems of Syn andling deadlock: Dea Memory Management Swapping, Contiguou e Page Table – Demar cation: ications such as traffi	son's Solution, Synchronchronization. Introduc dlock Prevention- Dead Assignment/Case Study s and Non-Contiguous d Paging – Page Replac	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara llock Avoidance- Deadlock detection Programming/Simulation/Data Collection s Memory Allocation, Segmentation cement, Allocation of Frames – Thra	emaphores acterization & Recovery 9 Hours on, Paging shing.
Topics: The Critical-Sec Monitors, Clas Methods for ha from Deadlock Module 4 Topics: Introduction, S Structure of the Targeted Appli Real time Appl	and Deadlocks ction Problem- Peters sical Problems of Syn andling deadlock: Dea Memory Management Swapping, Contiguou e Page Table – Demar cation: ications such as traffi	son's Solution, Synchronchronization. Introduction dlock Prevention- Deace Assignment/Case Study	onization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara llock Avoidance- Deadlock detection Programming/Simulation/Data Collection s Memory Allocation, Segmentation cement, Allocation of Frames – Thra	emaphores acterization & Recovery 9 Hours on, Paging shing.
Topics: The Critical-See Monitors, Clas Methods for ha from Deadlock Module 4 Topics: Introduction, S Structure of the Targeted Appli Real time Appl	and Deadlocks ction Problem- Peters sical Problems of Syr andling deadlock: Dea Memory Management Swapping, Contiguou e Page Table – Demar cation: ications such as traffi e there are entities th	son's Solution, Synchronchronization. Introduc dlock Prevention- Dead Assignment/Case Study s and Non-Contiguous d Paging – Page Replac	Denization hardware, Mutex locks, S ction to Deadlocks, Deadlock Chara llock Avoidance- Deadlock detection Programming/Simulation/Data Collection s Memory Allocation, Segmentation cement, Allocation of Frames – Thra h, banking system, health care and i e resources.	emaphores acterization & Recovery 9 Hours on, Paging shing.

- 1. Oracle Virtual Box/VMWare Virtualization software [Virtual Machine Managers]. Used to install and work on multiple guest Operating Systems on top of a host OS.
- 2. Intel Processor identification utility: This software is used to explain about multi-core processors. It helps to identify the specifications of your Intel processor, like no of cores, Chipset information, technologies supported by the processor etc.

Project work/Assignment

1> Develop programs to demonstrate the below concepts.	
Process creation using fork() system call in Linux OS.	
IPC using POSIX shared memory API.	
Process synchronization using POSIX API.	
Monitors usage in JAVA/C#.	
Process creation using CreateProcess() system call in Windows OS.	

- 2> Develop your own CLI/Shell for Linux OS[like a mini BASH].
- 3> Download the Linux/ Fuchsia Kernel and compile and run.
- 4> Using POSIX Semaphores solve the below synchronization problem.

There are 3 processes [P1, P2, P3] having 3 statements S1, S2, S3. The requirement is that irrespective of the order of execution of the processes the statements should execute in the order S1, S2, and S3.

- 5> Using POSIX Semaphores demonstrate the scenario where in deadlock happens because of incorrect use of the semaphores.
- 6> Write a C#/Java program to implement the algorithm you studied to solve the Dining Philosopher problem using Monitors.
- 7> Simulation of memory management techniques.
- 8> Simulating synchronization issues in banking system transactions and traffic management.
- 9> Installation of Windows 10, Linux.

Text Book

1. Silberschatz A, Galvin P B and Gagne G, "Operating System Concepts", 9th edition Wiley, 2013.

References

- 1. Operating Systems | Internals and Design Principles | Ninth Edition | By Pearson Paperback 1 March 2018. by William Stallings (Author)
- 2. https://www.os-book.com/OS9/

Topics relevant to development of "Foundation Skill" and "Skill Development": Processes, Threads, CPU Scheduling, Synchronization, Memory Management.

Topics relevant to "Environment and Sustainability": Concepts of Multithreading, Deadlocks.

-		
Catalogue	Mr Sunilkumar Teggihalli, Mr Asif Mohamed H B, Mrs Sneha S Bagalkot,	Mr Rupam Bhagawati.
prepared by		0
Recommended by the Board of Studies on	BOS NO: 11 th. BOS to be held	REGISTRAR
Date of Approval by the Academic Council	Academic Council Meeting No. 14 to be held	A MAGAL

Course Code: CSE2012		oase Management Sy ogram CoreTheory– ed		L-P-C	2	4	4
Version No. Course Pre-	1.0 Data Structures and	Algorithms Diffe	rent wave of c	vraanizin	α the	e date	a and
requisites	Selection methods.	Algorithms – Diffe	Tent ways of C	ngamzin	ig th	c uau	a anu
Anti-requisites	NIL						
Course Description	and implementation of course covers there a how to organize, ma students to learn and The associated labor structured query 1	This course introduces the core principles and techniques required in the design indimplementation of database systems. This introductory application-oriented course covers therelational database systems[RDBMS].More emphasis is set on now to organize, maintain and retrieve the information efficiently. It helps the tudents to learn and practice data modeling and database designs. The associated laboratory is designed to implement database design using tructured query languages in information technology applications. All heexercises will focus on the fundamentals for creating sophisticated, interactive,					
Course Out Comes	On successful compl 1] Describe the core 2] Illustrate the de Normalization.	etion of the course th concepts of relational esign principles for ry evaluation and que cepts of Transaction r	l database mana Database des ry optimization nanagement.	igement s sign, El	syste R M		and
Course Content:							
Module 1	Introduction to databases and Relational Algebra	Assignment	Programming	task	8 (Class	es
Schemas, and In design using ER-	Database: Characteria Istances, Data Model Relational mapping, Ira: Relational algebra	ling using Entities a Query By Example(C operators, relational	nd Relationship (BE). operations from	os, Rela	ationa ry, bi	al dat	
relational operati	ons: JOIN and DIVIS	ION, examples of que		ai aigeoi	а.	0	

	ed on Primary Keys- (ourth Normal Form, Jo			
Module 3	Query Processing And Optimization	Assignment	Programming Task	4 Classes
Query Processing for executing query	and Optimization: Qu y operations.	ery interpretation, E	quivalence of expres	ssions, Algorithm
Module 4	Transaction Management.	Assignment	Problem Solving	6Classes
	ystem concepts, Desir es-characterizing schec es.	1 1	-	2
Classes] Level 1: Perform c on Student DB. Level 2: Identify th on a given scenario Experiment No. 2	I: To study and imploperations using Data I be given requirements; b. [Movie Databases] c: To implement Data I be perations using Data I	Definition Language valid attributes and d Manipulation Langua	commands like Creat lata types and Perform age commands of SQ	e, Alter and Drop n DDL operations L. [4 Classes
	valid DML operations	to manipulate the dat	ta inside the tables to	achieve expected
Level 1: Create t	To implement differe ables on Banking da nd Other Constraints.	•••		IULL, UNIQUE,
5	ifferent types of data as es as per the given scer	e	5	n the requirement
Experiment No. 4 WHERE clause. [4: To study and impl [4 Classes]	lement SQL data ro	etrieval using SELE	CT, FROM and
Level 1: Illustrate	the working of SELE	CT, FROM and WH	ERE clause on Banki	ng Database. 🏾 🔌
PU/AC-20.3/SOCSE01	/CSG/2020-2024			Page 93 of 157

Level 2: Implement SQL queries for Data Retrieval for a given Database using SQL clauses as per the given scenario.[Music Databases]

Experiment No. 5: To Retrieve Data from Database using different types of operators. [4 Classes]

Level 1: Demonstrate the working of relational, logical, pattern matching, BETWEEN, IS NULL, IN and NOT IN Special Operators on Banking Database.

Level 2: Implement SQL queries for Data Retrieval on a given Database using different types of operators.

Experiment No. 6: To study and implement aggregating Data using Group by, HAVING and sort data using Order By Clauses. [4 Classes]

Level 1: Implement the conjugate of GROUP BY, ORDER BY and aggregate functions on Banking Database.

Level 2: Implement SQL queries for Data Retrieval on a given Database using appropriate clauses and aggregate functions.[Library databases]

Experiment No. 7: To study and implement different types of Set and Join Operations [4 **Classes**]

Level 1: Demonstrate different types of Set Operations (UNION,UNION

ALL,INTERSECT,MINUS) and Join Operations (INNER JOINS,OUTER JOINS,CROSS JOIN,NATURAL JOIN).Use Bank Database.

Level 2: Use Set and Join operations to retrieve the data from two or more relations as per the given scenario..[Library databases]

Experiment No. 8: To Retrieve Data from a given Database using Nested queries, Correlated queries. [4 Classes]

Level 1: Implement Data Retrieval using Nested and Correlated queries on a given Database.[Airline Database]

Level 2: Analyze the difference between nested query, correlated query choose the appropriate one as per the Mini Project domain

Experiment No. 9: To study and implement Views, Procedures, Functions and Triggers in SQL [4 Classes]

Level 1: Implement SQL Views, Procedures, Functions and Triggers in SQL on Employee database. Level 2: Analyze the requirement and construct views, Procedures, Functions and Triggers-Mini Project Domain.

Targeted Application & Tools that can be used:

Application Area: Relational database systems for Business, Scientific and Engineering Applications.

Tools/Simulator used: Mysql.

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Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

- 1. Problem Solving: Constructing ER-Diagrams for a given real time requirements, Normalizing the databases, querying the databases using relational algebra.
- 2. Programming: Implementation of given scenario using SQL.
- 3. Mini project: Build a real time database application using suitable frontend tool. Indicative areas include; health care, education, industry, Library, Transport and supply chain, etc.

Text Book

1. Elmasri R and Navathe S B, "Fundamentals of Database System", 7th Edition, 2016 Pearson Publication.

References

- 4. Database systems, the complete book- 2nd edition- Hector Garcia Molina, Jeffery D Ullman, Jennifferwidom. Pearson publication.
- 5. Database System Concepts 7th Edition, 2019, AviSilberschatz · Henry F. Korth · S. Sudarshan. McGraw-Hill

Topics relevant to development of "FOUNDATION SKILLS": S - Skill Development: Relational database design using ER- Relational mapping, Query By Example (QBE). Implementation of given scenario using SQL.

Topics relevant to development of Employability: Administer, test and implement computer databases, creating sophisticated, interactive and secure database applications

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS: Nil

	6. Dr.R.Mahalakshmi
	7. Mr. Mrutyunjaya M S.
Catalogue	8. Dr. Manujakshi B C.
prepared by	9. Ms. Napa lakshmi.
	10. Mr. James Mathew.
	11. Ms. Shaleen Bhatnagar.
Recommended	Mention the BOS Number and the Date of BOS
by the Board of	
Studies on	
Date of	Mention the Academic Council Meeting
Approval by the	No. & the date of the meeting:
Academic	
Council	aunte
	REGISTRAR

Course Code: CSE2018	Course Title: Theory of Computations	L- P- C	3	0	A TOTALORE
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	Type of Course:	Program Core, Theory on	y Course		
Version No.	1.0				
Course Pre- requisites	•				
Anti-requisites	NIL				
Course Description	appreciate the language class required for th conceptual an Mathematical and analytical	study of formal language es and the automata that the students to analysis and d analytical in nature and computing. The cou	Course is to enable the stud e and the correspondence be t recognizes. Analytical ab nd to develop, the course i and needs fair knowled rse develops the critical th t helps the students to bui ine for the Language.	etween ility is is both lge of inking	
Course Out Comes	 Describe Fin Distinguish 	On successful completion of the course the students shall be able to: 1] Describe Finite Automata for the given Language. 2] Distinguish between Regular Grammar and Context Free Grammar 3] Construct Push Down Automata for a given language.			
Course Content:			•		
Module 1	Finite Automata	Case Study	Simulation	12 Classes	
LODICS.	Automata Th	eory Applications of			
Representation of concepts of Finite and Languages and Languages and	of automata, La e automata, DFA nd DFA's, Regu NFA's. Equiva	Inguage recognizers, Ex A- definitions of DFA, D Ilar Languages, NFA- D	Automata Theory, Basi ample for language Recon- peterministic Accepters Tran- efinition of a Nondetermini- and Nondeterministic Fin	gnizers. Basic nsition Graphs istic Accepter,	

- ·
I opics:
1

Formal Definition of a Regular Expression, Languages Associated with Regular Expressions, Closure Properties of Regular Languages, Pumping Lemma, Context Free Grammars-Examples of Context-Free Languages, Leftmost and Rightmost Derivations, Derivation Trees, Ambiguity in Grammars and Languages, Chomsky Normal Form, Greibach Normal Form.

Module 3	Push Down Automata	Assignment	Simulation	7 Classes
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Topics:

Definition of a Pushdown Automaton, Language Accepted by a Pushdown Automaton, Pushdown Automata for Context-Free Languages, and Context-Free Grammars for Pushdown Automata, Nondeterministic Pushdown Automata and Deterministic Pushdown Automata.

Module 4	Turing Machine	Assignment	Programming/Simulation	7 Classes
Topics				

Topics:

Definition of a Turing Machine, Turing Machines as Language Accepters, Example Languages to construct Turing machine, Turing Machines as Transducers ,example Transducers

Targeted Application & Tools that can be used:

Targeted Application:

[1]. Text Processing

- [2]. Compilers
- [3]. Text Editors
- [4]. Robotics Applications
- [5]. Artificial Intelligence

Tools:

JFLAP (Java Formal Language and Automata Package) Software simulation tool. It's interactive educational software written in Java to experiment topics in automata theory.
 Turing machine Online simulators.

Project work/Assignment:

 Simulate and verify the string acceptance and rejection using deterministic finite automuta / Push down automata / Turing machine for any given regular language or a non-regular language in JFLAP software simulation tool. 2. Write a program to convert non-deterministic finite automata to deterministic finite automata.

3. Implement the given context free grammar and verify the string parsing. Text Book

1. Peter Linz, "An introduction to Formal Languages and Automata", Jones and Bartlett Publications 6th Ed, 2018.

References

- 1. Aho, Ullman and Hopcroft, "Theory of Computation", Pearson India 3rd Edition 2008.
- 2. Michael Sipser, "Theory of Computation", Cengage India 3rd Ed, 2014.

Topics relevant to Development of "Foundation Skills": Language Recognizers, Basic Concepts of Finite Automata.

Catalogue prepared by	Dr. Manujakshi B C , Ms. Thasni T, Ms. Manjula H M, Ms. Megha D Bengaluru, Ms. Dipali K Dakhole, Ms. Sheethal Aji Mani, Ms. Nikita, Ms. Shwetha P C
Recommended by the Board of Studies on	BOS NO: 11 th. BOS held on 23/4/21
Date of Approval by the Academic Council	Academic Council Meeting No. 14, Dated 21/5/21

Course Code: CSE2011	Course Title: Data Communications and Computer Networks				
	Type of Course: Program Core Theory–Laboratory integrated	L-P-C	2	2	3
Version No.	1.0			•	
Course Pre- requisites	NIL	(0	10.	_
Anti-requisites	NIL	c	an	SEN	Y UNILES
		RE	GISTRA	RWRe	distrar 0

Course Description Course Out Comes	 The objective of this course is to provide the knowledge in data communications and computer networks, its organization and its implementation, and gaining practical experience in installation, monitoring, and troubleshooting of LAN systems. The associated laboratory is designed to implement and simulate various networks using cisco packet tracer, NS2. All the lab exercises will focus on the fundamentals of creating multiple networks, topologies and analyzing the network traffic. On successful completion of the course the students shall be able to: 1. Explain the concepts of Computer Networks and Working Principles of Application Layer and Transport Layer (Comprehension) 2. Apply the Knowledge of IP Addressing and Routing Mechanism in Computer Networks. (Application) 3. Discuss the functionalities of Data Link Layer (Comprehension) 4. Explain the Basic Concepts of Data communication. (Comprehension) 					
Course Content:						
Module 1	Overview, Application and Transport Layers.	Assignment	Problem Solving	13 Classes		
The Web and HTT Introduction and T	P, DNS—The Internet's Transport-Layer Services,	s, OSI Reference Model, T Directory Service, Socket Connection-less Transpo es of Congestion Control, T	Programming: Creating ort: UDP, Principles of	Network Applications.		
Module 2	Network Layer	Assignment	Problem Solving	12 Classes		
Overview of Network Layer, Forwarding and Routing, The Data and Control Planes.The Internet Protocol (IP): IPv4, Addressing, IPv6, IPv4 Datagram Format, IPv4 Addressing, Network Address Translation (NAT), IPv6. Introduction Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Intra-AS Routing in the Internet, OSPF Routing Among the ISPs: BGP, Introduction to BGP. ICMP: The Internet Control Message Protocol.						
Module 3	dule 3 Data Link Layer Assignment Problem Solving 10 Classes					
Checks, Check sum	ming Methods, Cyclic Red ink-Layer Addressing an	l ovided by the Link Layer, E undancy Check (CRC), Mu d ARP, Ethernet, Link-I	Itiple Access Links and P	rotocols. Switched Local		

Module 4	Physical Layer with Data Communication	Assignment	Problem Solving	07 Classes
Sine Wave, Phase, V Impairment, Data I Bandwidth, Through	ns: Components, Data Repre Vavelength, Time and Freque Rate Limits: Noiseless Chan nput, Latency (Delay), Bandwi g, Wavelength-Division Mult	ency Domains, Composite nel, Nyquist Bit Rate, N idth-Delay Product, Parall	Signals, Bandwidth, Digi oisy Channel: Shannon Iel/Serial Transmission, N	tal Signals, Transmissio Capacity, Performance Aultiplexing: Frequency
Targeted Applic	ations & Tools that can	be used: Cisco Packe	et Tracer, Wireshark,	and NS2.
-	gnment: Choose and an	alyze a network fror	m any organization/	Assignment
proposed for thi	s course in co1-co4			
12. Problem	Solving: Choose and ap ming: Simulation of any		•	s network concepts
12. Problem 13. Program Text Book T1. James F. Kurose	Solving: Choose and ap	network using NS2.	<i>pproach",</i> 8 th Edition, Pe	arson, 2021.
12. Problem 13. Program Text Book T1. James F. Kurose T2. Behrouz A. Foro	Solving: Choose and ap ming: Simulation of any , Keith W. Ross, "Computer N	network using NS2.	<i>pproach",</i> 8 th Edition, Pe	arson, 2021.
 13. Program Text Book T1. James F. Kurose T2. Behrouz A. Foro References R1. William Stallings 	Solving: Choose and ap ming: Simulation of any , Keith W. Ross, "Computer N	network using NS2. Networking A Top down A s and Networking", 6 th Ec nunication", 10th Edition	<i>pproach",</i> 8 th Edition, Pe lition, Tata McGraw-Hill, , Pearson Education, 201	arson, 2021. 2021. 7.
12. Problem 13. Program Text Book T T1. James F. Kurose T T2. Behrouz A. Foro References R1. William Stallings R2. Larry L. Peterson Web Based Resource Digital Learning Res	Solving: Choose and ap ming: Simulation of any , Keith W. Ross, "Computer N uzan, "Data Communication. s: "Data and Computer Comm n and Bruce S. Davie: Compu	Network using NS2. Networking A Top down A s and Networking", 6 th Ec nunication", 10th Edition ter Networks – A System	<i>pproach",</i> 8 th Edition, Pe lition, Tata McGraw-Hill, , Pearson Education, 201	arson, 2021. 2021. 7.
12. Problem 13. Program Text Book F. Kurose F2. Behrouz A. Foro References R1. R1. William Stallings R2. Larry L. Peterson Web Based Resource Digital Learning Res	Solving: Choose and ap ming: Simulation of any , Keith W. Ross, "Computer N uzan, "Data Communication. s: "Data and Computer Comm n and Bruce S. Davie: Compu ces and E-books: sources (Library Resources) rsity.informaticsglobal.com/l	v network using NS2. Vetworking A Top down A s and Networking", 6 th Ec nunication", 10th Edition ter Networks – A System ogin	<i>pproach",</i> 8 th Edition, Pe lition, Tata McGraw-Hill, , Pearson Education, 201	arson, 2021. 2021. 7.
 Problem Program Program Program Program Text Book T1. James F. Kurose T2. Behrouz A. Foro References R1. William Stallings R2. Larry L. Peterson Web Based Resource Digital Learning Res W1. https://puniver	Solving: Choose and ap ming: Simulation of any , Keith W. Ross, "Computer N uzan, "Data Communication. s: "Data and Computer Comm n and Bruce S. Davie: Compu ces and E-books: sources (Library Resources) rsity.informaticsglobal.com/I 14. Dr. Shamuga	Network using NS2. Networking A Top down A s and Networking", 6 th Ec nunication", 10th Edition ter Networks – A System ogin	<i>pproach",</i> 8 th Edition, Pe lition, Tata McGraw-Hill, , Pearson Education, 201	arson, 2021. 2021. 7.
12. Problem 13. Program Text Book T1. James F. Kurose T2. Behrouz A. Foro References R1. William Stallings R2. Larry L. Peterson Web Based Resourd Digital Learning Res W1. <u>https://puniver</u>	Solving: Choose and ap ming: Simulation of any , Keith W. Ross, "Computer N uzan, "Data Communication. s: "Data and Computer Comm n and Bruce S. Davie: Compu ces and E-books: sources (Library Resources) (Sity.informaticsglobal.com/l 14. Dr. Shamuga 15. Dr. Ashish Ku	v network using NS2. Vetworking A Top down A s and Networking", 6 th Ec nunication", 10th Edition ter Networks – A System ogin rathinam	<i>pproach",</i> 8 th Edition, Pe lition, Tata McGraw-Hill, , Pearson Education, 201	arson, 2021. 2021. 7.
12. Problem 13. Program Text Book T T1. James F. Kurose T T2. Behrouz A. Foro References R1. William Stallings R2. Larry L. Peterson Web Based Resource Digital Learning Res	Solving: Choose and ap ming: Simulation of any , Keith W. Ross, "Computer N uzan, "Data Communication. s: "Data and Computer Comm n and Bruce S. Davie: Compu ces and E-books: sources (Library Resources) rsity.informaticsglobal.com/I 14. Dr. Shamuga	v network using NS2. Networking A Top down A s and Networking", 6 th Ec nunication", 10th Edition ter Networks – A System ogin rathinam mar Srivastava indhuri	<i>pproach",</i> 8 th Edition, Pe lition, Tata McGraw-Hill, , Pearson Education, 201	arson, 2021. 2021. 7.

Recommended by the Board of Studies on	BOS NO: 12th BOS, held on 04/08/2021
Date of Approval by the Academic Council	Academic Council Meeting No. 16, Dated 23/10/2021

Course Code: CSE 2014	Course Title: Software En Type of Course: School Co		61	L- P- C	3	0	3
		ire [meory On	iyj				
Version No.	1.0						
Course Pre- requisites	NIL						
Anti-requisites	NIL						
Course Description	The objective of this course is to provide the fundamentals concepts of Software Engineering process and principles. The course covers software requirement engineering processes, system analysis, design, implementation and testing aspects of software system development. The course covers software quality, configuration management and maintenance.						
Course Out	On successful completion of						
Comes	 Describe the Software Eng Identify the requirement application(Comprehension) Understand the Agile Prince Apply an appropriate plana software(Application) 	ents, analysis ciples(Knowledg	and appropria	te desigr	n mode	ls for	a given
						-	
Module 1	Introduction to Software Engineering and Process Models (Knowledge level)	Quiz				()9 Hours
Introduction: Need	for Software Engineering, Pi	rofessional Soft	ware Developm	nent, Soft	ware En	gineerir	ng Ethics,
Software Engineerin	g Practice-Essence of Practice, lodel – Classical Waterfall Mod	General Princip	les Software De	velopmen	t Life Cyc	cle	
Widdels. Waterfail W	Software Requirements,		Developmen		mouer		iototype.
Module 2	Analysis and Design	Assignment	documents for				L1 Hours
	(Comprehension level)	7 SSIGninene	scenario	or a given		-	
Requirements Specif Cases, Activity diagr Architecture of a CA	neering : Eliciting requireme fication (SRS), Requirement An am and Swim lane diagram. C	alysis and valida ASE support in	and non- Fu ation. Requirem Software Life C	ents mode ycle, Char	lling- Int acteristic	roducti	on to Use
Module 3	Agile Principles & Devops (Knowledge level)	Quiz			0	ISTRAR	00 Hours

Agile: Scrum Roles and activities, Sprint Agile software development methods - Scaling, User Stories, Agile estimation techniques, Product backlogs, Stake holder roles, Dynamic System Development Method. **Devops:** Introduction, definition, history, tools.

Module 4	Software Testing and Maintenance (Application Level)	Assignment	Apply the testing concepts using Programing	12 Hours				
Software Testing-verification and validation, Test Strategies - White Box Testing, Black box Testing.								
Automation Tools for Testing.								
Software Quality	Software Quality Assurance-Elements of software quality assurance, SQA Tasks, Goals and Metrics,							
-	ation management- SCM pro							
		Maintenance	, Software Reverse Engineeri	ng, Software				
Maintenance Proc								
Targeted Applicat	ion & Tools that can be use	d: Selenium, G	itHub, CASE Tools					
Project work/Assi	gnment: Mention the Type	of Project /As	signment proposed for this cours	se				
1] Identification	of Software Process Models	for a given sce	enario					
2] Development	of SRS documents for a give	n scenario						
3] Apply the whit	e box and black box testing	concepts using	g Programing					
4] Installing Seler	nium/GitHub software and e	exploring the fu	unctionality					
Text Book								
1] Roger S. Pressmar	n, "Software Engineering – A P	ractitioner's App	proach", VII Edition, McGraw-Hill, 20	17.				
2] Bob Hughes, Mike	e Cotterell, Rajib Mall, "Softwa	re Project Mana	gement", VI Edition, McGraw-Hill, 20)18.				
References								
1] Rajib Mall, "Funda	amentals of Software Engineer	ing", VI Edition,	PHI learning private limited, 2015.					
2] Ian Sommerville	e, "Software Engineering", I>	K Edition, Pears	on Education Asia, 2011.					
3] Agile Software [Development Principles, Pat	terns and Prac	tices.1 st Edition, Wiley, 2002					
Catalogue prepared by	Dr. S. Pravinth Raja, Associat Ms. Sweet Subhashree, Assis							
Recommended by	BOS NO: 12th BOS, held							
the Board of	$\begin{bmatrix} 1005 \\ 100. \\ 1201 \\ 1005,$	011 04/08/202	L					
Studies on								
Date of Approval	Academic Council Meetin	a No. 16 Data	d 23/10/2021					
by the Academic		g 110. 10, Dale	u 23/10/2021					
Council								
council								

Course Code:	Course Title: Theory of Computations	L- P- C	3 0 3
CSE 2018			SELCT ON LE
Version No.	0.9		REGISTRAK Registrar
Course Pre- requisites	NIL		RANGALOR

Anti-requisites	NIL					
Types of Skills	Foundation Skills,	Analytical, Logical and Mat	hematical Thinking			
Course Caters to	Metatheory of Computing					
Course Description	The purpose of Theory of Computation Course is to enable the students to appreciate the study of formal language and the correspondence between language classes and the automata that recognizes. Analytical ability is required for the students to analyze and develop. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematical and computing. The course develops the critical thinking and analytical skills. The simulation using JFLAP makes the student to visualize the automata construction and string parsing. The project work helps the students to build any context free grammar and Turing Machine for the Language.					
Course Out Comes	On successful completion of the course the students shall be able to:[1] Understand basic concepts of Automata and its types. (Knowledge)[2] Construct Finite Automata with its Simulation. (Application)[3] Distinguish between Regular Grammar and Context Free Grammar.(Comprehensive)[4] Design Push Down Automata. (Application)[5] Implement Turing machine for a Language. (Application)					
Course Content:						
Module 1	Introduction to Automata Theory	Assignment	Data Collection	6 Hours		
			Automata Theory, Basic De mple for Language Recognizers.	finitions,		
Module 2	Finite Automata	Assignment	Simulation	12 Hours		
Topics:			REGISTRAR	Registrar		
1		-	DFA, Deterministic Accepters T NFA- Definition of a Nondete			

Module 3	Regular Expressions & Context Free Grammar	Assignment	Programming	8 Hours
		· · · ·	mma, Context Free Grammars-Ex rivations, Derivation Trees, Aml (Compr	-
Module 4	Push Down Automata	Assignment	Simulation	7 Hours
Module 5	Turing Machine	Assignment	Programming/Simulation	6 Hours
Module 5	-	Assignment	Programming/Simulation	6 Hours
Topics:				
-	-	uring Machines as La	anguage Accepters, Example Lan (Ap	
Definition of a construct Turi	ing Machine. plication & Tools th			guages to
Definition of a construct Turi	ing Machine. plication & Tools th lication: essing s ors Applications			
Definition of a construct Turi Targeted App Targeted App [1] Text Proc [2] Compilers [3] Text Edito [4] Robotics A [5] Artificial	ing Machine. plication & Tools th lication: essing s ors Applications			
Definition of a construct Turi Targeted App Targeted App [1] Text Proc [2] Compilers [3] Text Edito [4] Robotics A [5] Artificial Tools: [1] JFLAP (Ja	ing Machine. plication & Tools th lication: essing s ors Applications Intelligence ava Formal Language	a t can be used: e and Automata Packa		plication

Project work/Assignment:

- 4. Simulate and verify the string acceptance and rejection using deterministic finite automata / Push down automata / Turing machine for any given regular language or a non-regular language in JFLAP software simulation tool.
- 5. Write a program to convert non-deterministic finite automata to deterministic finite automata.
- 6. Write a Java program to verify the given context free grammar is valid not.
- 7. Write a Java program to validate the given input (check it is valid or not) using Regular Expression.
 - i) IP Address
 - ii) Aadhaar number

Text Book

2. Peter Linz, "An introduction to Formal Languages and Automata", Jones and Bartlett Publications 6th Edition, 2018.

References

- 1. Aho, Ullman and Hopcroft, "Theory of Computation", Pearson India 3rd Edition, 2008.
- 2. Michael Sipser, "Theory of Computation", Cengage India 3rd Edition, 2014.

Topics relevant to Development of Foundation Skills: Language Recognizers, Basic Concepts of Finite Automata.

Catalogue	1. Dr. Manujakshi B C
prepared by	2. Ms. Dipali K Dakhole
	3. Dr. Gowthul Alam M M
Recommended	BOS NO: 13 th BOS, held on 08/12/2021
by the Board	
of Studies on	D
Date of	Academic Council Meeting No. 17, Dated 11/12/2021
Approval by	
the Academic	REGISTRAR
Council	EINGALOS

Catalog	Catalogue reviewed in DAC meeting held on 28.01.2022 and subject to approval
Reviewed	in BOS
Details	

	Course Title: Discrete Ma	thematical Structures				
Course Code: MAT2004	Type of Course: Program	Core	L- P- C	3	0	3
Version No.	1.0					1
Course Pre-	Nil					
requisites						
Anti-requisites	Nil					
Course Description	and predicate calculus. structures, lattices and	ghts into the fundament The course delves deepl Boolean algebras whicl g. It also highlights the pi	y into the n are wide	concept ely used	s of alg in con	ebraic nputer
Course Objective	The objective of the Participative Learning	course is Skill Devel techniques.	opment (of stud	ent by	using
Course	On successful completion	on of the course the stud	ents shall	be able	to	
Outcomes	connectives. CO-2: Comprehend th relations. CO-3: Elucidate the cor	sentences through pred e basic principles of set ncepts of lattices and Boo ting techniques to tackle	theory a	nd diffe ora.	rent ty	pes of
Course Content:						
Module 1	Mathematical Logic and Predicate Calculus				12 S	essions
Propositional Lo	ogic, propositional logic equiv	alences, normal forms, infe	erence rules	s, introdu	iction to	
conversion to c calculus.	lausal form, predicate calculu	us, the statement function	inference	theory o	f the pro	•
calculus. Module 2	Algebraic Structures				10 S	edicate
calculus. Module 2 Sets and set oper		their properties & representa	tions of rela		10 S	edicate

Distributive la	g, Posset, Lattices & Algebraic stru ttices, complement of an element mplement theorem.	-		
Module 4	Principles of Counting Techniques			12 Sessions
	inder theorem, Pigeonhole princ rmutations and combinations, rec		ole principle, mathemati	cal induction,
Discrete mathe data structure computer secu	ications & Tools that can be us ematics provides the mathemat es, algorithms, database theo prity, and operating systems. S-Excel / Mathematica / Maple	ical foundations for mar ry, automata theory,		-
Project work/	Assignment: Mention the Type	of Project /Assignment	proposed for this cours	se
Assignment 2:	Logical equivalences and prec Equivalence relations and latt Recurrence relations.			
Text Book 1. Kenneth I	H. Rosen, "Discrete Mathematic	cs and its Applications",	7th Edition, McGraw-Hil	l, 2011.
Scienc 2. Grimal Pearsc 3. Epp Su 2016.	lay, J.P. and Manohar.R, "Disc e", 30th Reprint, Tata McGraw di R.P., "Discrete and Combin on Education, New Delhi, 2007. sanna S, "Discrete Mathematics	Hill, New Delhi, 2011. atorial Mathematics: A s with Applications", 4 th	n Applied Introduction" Edition, Cengage Learnir	, 4th Edition, ng, New Delhi,
Editior 5. Liu, C 4 th Edit	n Bernard, Busby Robert C and n, Pearson, India, 2015. L Mohapatra, D P.," Elements tion, McGraw Hill, New Delhi, 2 d Johnsonbaugh, Discrete Math	of Discrete Mathemat 2015.	ics a Computer oriented	
7. Mott J	loe L, Kandel Abraham, Baker sts and Mathematicians", 2 nd E	Theodore P, "Discrete	Mathematics for Com	puter
1. <u>https://ope</u> 2. https://op 3. https://dir	https://presiuniv.knimbus.com en.umn.edu/opentextbooks/ en.umn.edu/opentextbooks/ ectory.doabooks.org/handle	textbooks/394 /textbooks/237	~ REGIST	TRAR 2 (Registrar)
• • • •	s crete.openmathbooks.org/po w.pdfdrive.com/discrete-ma	•	2.html	A BUNGALOR

3. https://www.cis.upenn	.edu/~jean/discmath-root-b.pdf
Video Lectures	
1. https://www.youtube.c	:om/watch?v=i3CpxxFedIA
2. https://www.youtube.c	com/watch?v=FMh8qNV3PHk
3. https://archive.nptel.ac	.in/courses/111/107/111107058/
Catalogue prepared by	Dr. M. Rajeshwari
Recommended by the Board of Studies on	8 th BOS on 23 rd July, 2022
Date of Approval by the Academic Council	18 th AC on 3 rd August 2022

Course Code:	Course Title: Cloud Computi	ng				
CSE2013	Type of Course: Theory		L- P- C	3	0	3
Version No.	1.0					
Course Pre-	[1] Data Communication	and Computer Net	works (CSE201	l)		
requisites						
Anti-requisites	NIL					
Course Description	This course provides a ha capabilities across the var as a Service (IaaS), Platf (SaaS). It dives into all o to plan for developing ap	rious Cloud service form as a Service (P of the details that a oplications on the cl	models includin aaS), and Softw student needs to loud and what t	g Infra are as o knov	astru 5 a Se w in 6	cture ervice order
	using applications or service					
Course Objective	using applications or serv This course is designed SKILLS using EXPERIE	d to improve the	learner's EMI	PLOY	ABI	LITY
Course Objective	This course is designed	d to improve the ENTIAL LEARNIN	learner's EMI G techniques.	PLOY	ABI	LITY
	This course is designed SKILLS using EXPERIE	d to improve the ENTIAL LEARNIN the course the students	learner's EMI G techniques.	PLOY	ABI	LITY
	This course is designed SKILLS using EXPERING Upon successful completion of 6) Understand the significa 7) Identify appropriate Virt	d to improve the ENTIAL LEARNIN the course the students nce of Cloud computir ualization techniques	learner's EMI G techniques.			
	This course is designed SKILLS using EXPERING Upon successful completion of 6) Understand the significa 7) Identify appropriate Virt 8) Discuss Cloud mechanism	d to improve the ENTIAL LEARNIN the course the students nce of Cloud computinualization techniques to ns to optimize the Qos	learner's EMI G techniques. shall be able to: g technologies to virtualize infrast parameters			LITY
Course Outcomes	This course is designed SKILLS using EXPERING Upon successful completion of 6) Understand the significa 7) Identify appropriate Virt	d to improve the ENTIAL LEARNIN the course the students nce of Cloud computinualization techniques to ns to optimize the Qos	learner's EMI G techniques. shall be able to: g technologies to virtualize infrast parameters			
	This course is designed SKILLS using EXPERING Upon successful completion of 6) Understand the significa 7) Identify appropriate Virt 8) Discuss Cloud mechanism	d to improve the ENTIAL LEARNIN the course the students nce of Cloud computinualization techniques to ns to optimize the Qos	learner's EMI G techniques. shall be able to: g technologies to virtualize infrast parameters			
Course Outcomes	This course is designed SKILLS using EXPERING Upon successful completion of 6) Understand the significa 7) Identify appropriate Virt 8) Discuss Cloud mechanism	d to improve the ENTIAL LEARNIN the course the students nce of Cloud computinualization techniques to ns to optimize the Qos	learner's EMI G techniques. shall be able to: g technologies to virtualize infrast parameters	ructur		
Course Outcomes Course Content: Module 1	This course is designed SKILLS using EXPERIE Upon successful completion of 6) Understand the significa 7) Identify appropriate Virt 8) Discuss Cloud mechanism 9) Develop applications usi	d to improve the ENTIAL LEARNIN the course the students nce of Cloud computin ualization techniques t ns to optimize the QoS ng Cloud services and Assignment	learner's EMI G techniques. shall be able to: bg technologies to virtualize infrast parameters VM instances	ructur	es o. of asses:	10
Course Outcomes Course Content: Module 1 Topics: Evolution of clo	This course is designed SKILLS using EXPERIE Upon successful completion of 6) Understand the significa 7) Identify appropriate Virt 8) Discuss Cloud mechanism 9) Develop applications usi Introduction to Cloud services	d to improve the ENTIAL LEARNIN the course the students nce of Cloud computin ualization techniques t ns to optimize the QoS ng Cloud services and Assignment	learner's EMI G techniques. shall be able to: og technologies to virtualize infrast parameters VM instances Theory	ructur No Gi	es o. of asses:	10 ,PaaS,

Topics: Basics of Virtualization - Types of Virtualizations, Taxonomy of Virtualization Techniques, Implementation Levels of Virtualization.

Module 3	Cloud QoS and		Assignment		Theory No. of		No. of
would 5	Management		Assignment	meory			Classes:10
Topics: Cloud Infra	structure Mechanisms.	SLAs	Specialized	Cloud	Mechanisms.	Cloud	Management

Mechanisms, Cloud Security Mechanisms

Module 4	Application development in Cloud	Assignment	Case Study	No. of Classes:10
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Topics: Programming Models for Cloud Computing - Software Development in Cloud - Service creation environments to develop cloud-based applications. Development environments for service development (Demonstration using AWS Cloud); Dockers and Containers.

Targeted Application & Tools that can be used:

Targeted Applications:

Developing applications on Cloud Platforms via Virtual machines

Cloud Tools:

- CloudSim
- VMWare
- Amazon EC2
- Google Compute Engine
- Microsoft Azure

Project work/Assignment:

- 1. Automation of performance analysis of students through the Cloud
- 2. Chatbots development using Cloud resources
- 3. Blog creation using Cloud computing

Analysis of Case Studies: When deciding to adopt cloud computing architecture, decide if the cloud is right for your requirements (for the application identified).

Suggested List of Hands-on Activities:

SI. No	Title
	Install Virtualbox/VMware Workstation with different flavors of Linux or Windows OS on top of
1	windows 11
2	Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs.
	Install Google App Engine (GAE). Create a "hello world" application and other simple web
3	applications using python/java
4	Use GAE launcher to launch the web applications.
5	Simulate a cloud scenario using CloudSim and run a scheduling algorithm
6	Find a procedure to transfer the files from one virtual machine to another virtual machine

Catalo by	ogue prepared Dr. Gopal K. Shyam, Dr. Murali P., Image: Compared to the second secon
	4. Journal of Network and Computer Networking- https://www.journals.elsevier.com/journal-of-network-and-computer app/inations/
3	 CloudSim Resources- https://javadoc.io/doc/org.cloudsimplus/cloudsim- plus/latest/org/cloudbus/cloudsim/resources/class-use/Resource.html
2	International Journal of Cloud Computing- https://www.inderscience.com/jhome.php?jcode=ijcc
:	 IEEE Transactions on Cloud Computing- https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6245519
Web	Resources and Research Articles links:
Refer	 Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", PHI publisher 2013 edition. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill, 2010 edition. David E.Y. Sarna, "Implementing and Developing Cloud Applications", CRC Press, 2018 edition. Manvi, Sunilkumar, and Gopal K. Shyam. "Cloud Computing: Concepts and Technologies". CRC Press, 2021.
	edition. 2. John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press, 2010 edition.
	Book(s) Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, " <i>Mastering Cloud Computing</i> ", McGraw Hill Education, 2013
8	Demonstrate Migration, Cloning, and Snapshots within and across VMs
7	Find a procedure to launch a virtual machine using Openstack

	Mr. G Nagarajan
Recommended by the Board of Studies on	BOS NO: 19th BOS, held on 04/08/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/8/2022.

Course Code: CSE2007	Course Title: I	Design and Analysis of	f Algorithms		3	0	3	
	Type of Course	e: Program Core & The	eory only	L- P- C				
Version No.	2.1			•				
Course Pre-	CSE2001, Data	CSE2001, Data Structure and Algorithms						
requisites								
Anti-requisites	NIL							
Course	This intermediate course enables students to design and analyze efficient							
Description	algorithms to solve problems. This course covers typical design methods							
	U U	le-and-conquer, dyna		<i>v</i> 1	•			
	solve problen	ns. The students shall	l develop strong	analytica	l skills	as part o	of	
	this course.		1 0	5		1		
Course	This course is	designed to improve	the learners' EMP	LOYABII	ITY SK	KILLS by	y using	
Objectives	PROBLEM SO	LVING Methodologies.						
Course	On successful co	ompletion of the course	the students shall b	be able to:				
Outcomes		efficiency of a given algo						
Outcomes		e and conquer approach		-	tion]			
		namic programming app	-		-	cation]		
		em using the greedy me						
	5] Discuss the techniques to solve a real-world problem based on its complexity classes.							
	-		-				classes.	
Company Company	[Comprehen	ision]					classes.	
Course Content:	-	ision]					classes.	
Course Content:	-	ision]						
Course Content:	[Comprehen	nsion]						
Course Content: Module 1	[Comprehen		Problem Solvi	ng			06	
Module 1	[Comprehen	Assignment		ng		Se		
Module 1 Topics:	[Comprehen	Assignment	Problem Solvi				06 essions	
Module 1 Topics: Algorithm Design ar	[Comprehen Introduction to Algorithms	Assignment suring of running time o	Problem Solvi		d merge		06 essions	
Module 1 Topics: Algorithm Design ar Growth and Notatio	[Comprehen Introduction to Algorithms ad efficiency, mea ns. Recurrences	Assignment suring of running time o Masters method.	Problem Solvi f algorithms. Insertio		d merge		06 essions	
Module 1 Topics: Algorithm Design ar Growth and Notatio	[Comprehen Introduction to Algorithms ad efficiency, mea ns. Recurrences aratively evaluate	Assignment suring of running time o	Problem Solvi f algorithms. Insertio		d merge		06 essions	
Module 1 Topics: Algorithm Design ar Growth and Notatio Assignment: Compa	[Comprehen Introduction to Algorithms ad efficiency, mea ns. Recurrences irratively evaluate Review of	Assignment suring of running time o Masters method. bubble sort, insertion so	Problem Solvi f algorithms. Insertion rt and mergesort.	on sort an	0	sort, Asy	06 essions mptotic	
Module 1 Topics: Algorithm Design ar Growth and Notatio	[Comprehen Introduction to Algorithms ad efficiency, means. Recurrences aratively evaluate Review of Searching and	Assignment suring of running time o Masters method.	Problem Solvi f algorithms. Insertio	on sort an	0	sort, Asy	06 essions mptotic	
Module 1 Topics: Algorithm Design ar Growth and Notatio Assignment: Compa	[Comprehen Introduction to Algorithms ad efficiency, mea ns. Recurrences irratively evaluate Review of	Assignment suring of running time o Masters method. bubble sort, insertion so	Problem Solvi f algorithms. Insertion rt and mergesort.	on sort an	0	sort, Asy	06 essions mptotic	

Module 3 Topics:	Greedy Algorithms	n algorithm using Divide a Assignment	ind Conduer technique for a given s	
Topics:	-			scenario.
•	0	Assignment	Programming/ Problem Solving	Session
Introduction, Frac				•
•	tional Knapsack	v Problem, Minimal Spa	nning Tree: Prim's Algorithm an	d Kruskal
Algorithm, Single-s	ource Shortest I	Path: Dijkstra's Algorithm.	Huffman Codes.	
Assignment: Desig	n and Develop a	solution to a given scena	rio using greedy method.	
Module 4	Dynamic Programming	Assignment	Programming/ Problem Solving	C Session
Topics:	opranning	<u> </u>	I	5035101
•	xamples. Principl	es of Memoization. 0-1 Kr	napsack Problem, Bellman-Ford algoi	rithm. Flov
		Search Trees, Chain Matrix		, ,
-			igms learned so far and argue the best	approach
olve the problem				
	Complexity	Assistant		00 1101
Module 5	Classes and	Assignment	Programming/ Problem Solving	09 Hou
	Heuristics			
Topics:				
exity classes: P, N	P, and NP-Com	plete Problems. Backtrack	ing: n-Queens. Branch and bound:	Travelling
Salesman Problem			C C C C C C C C C C C C C C C C C C C	
			or solving queen's problems for 4, 8 ar	nd 16 input
Targeted Applicat	on & Tools that	can be used:		
••	-		of Algorithms. This fundamental co	urse is
used by all applica	tion developers			
Professionally Use	d Software: GC	C compiler.		
Project work/Assi	-	f Algorithms and implam	ontation of programs	
	alving: Docign o	-		
1. Problem S		ation of given economic up	sing Java.	
1. Problem S		ation of given scenario us	0	
1. Problem S 2. Programm		ation of given scenario us		
 Problem S Programm 	ning: Implement		nd Clifford Stein, <i>'Introduction to Algo</i>	orithms', N
1. Problem S 2. Programm Text Book: T1. Thomas H.Cc Press, 2022.	ning: Implement	eiserson, Ronald L. Rivest a	nd Clifford Stein, <i>'Introduction to Algo</i>	
 Problem S Programm Text Book: T1. Thomas H.Cc Press, 2022. T2. J. Kleinberg a 	ning: Implement		nd Clifford Stein, <i>'Introduction to Algo</i>	prithms', N
1. Problem S 2. Programm Text Book: T1. Thomas H.Cc Press, 2022. T2. J. Kleinberg a References	ning: Implement formen, Charles E.L and E. Tardos, 'Alg	eiserson, Ronald L. Rivest a orithm Design', Addison-We	nd Clifford Stein, <i>'Introduction to Algo</i> sley, 2005.	ALLA SENCY III
 Problem S Programm Text Book: T1. Thomas H.Cc Press, 2022. T2. J. Kleinberg a References R1. Anany Levitin 	ning: Implement ormen, Charles E.L and E. Tardos, 'Alg	eiserson, Ronald L. Rivest a orithm Design', Addison-We the Design and Analysis of A	nd Clifford Stein, <i>'Introduction to Algo</i>	
2. Programm Text Book: T1. Thomas H.Cc Press, 2022.	ning: Implement	eiserson, Ronald L. Rivest a	nd Clifford Stein, <i>'Introduction to Algo</i>	

R3. AV Aho, J Hopcroft, JD Ullman, 'The Design and Analysis of Algorithms', Addison-Wesley, 1974.					
Catalogue	Dr Sandeep Albert Mathias, Dr Murali Parameswaran				
prepared by					
Recommended by	BOS NO: 12th BOS, held on 04/08/2021				
the Board of					
Studies on					
Date of Approval	Academic Council Meeting No. 16, Dated 23/10/2021				
by the Academic					
Council					

Course Code: CSE 2021	Course Title:Data Minin TypeofCourse:Discipline Theory	e Elective in Big Da	ita Basket	L-P-C	3	0	3
Version No.	1.1						
Course Pre- requisites							
Anti-requisites	NIL						
Course Description	This course introduces an extensive study on data pre-processing and classification algorithms. This course will help the students in selecting suitable data mining algorithms to solve the real time problems, and to discover frequent item sets by association rule algorithm. The course emphasizes on the recent trends in spatial mining. It interacts the students to study the different Clustering algorithms.						
Course Objective	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEMSOLVING Methodologies.						
Course Out Comes	Comes On successful completion of the course the students shall be able to: [1] Describe the basic concepts and issues involved in Data Mining. [Knowledge]						
 [2] Discuss different preprocessing techniques on Data Analysis. [Comprehension] [3] Discover frequent item sets by using Association rule algorithms. [Application] 							
[4] Apply different Classification algorithms in data mining. [Application][5] Applythe variousclustering techniques.[Application]							NCYUN
Course Content:					REG	STRAR	registrar)
Module 1	Introduction to Data Mining	Assignment	Data Co	ollection		6 Ses	sions

Topics:Introduction to Data mining: Definition, KDD, Challenges, Data Mining Tasks - Data Mining Goals- Stages of the Data Mining Process–Data Mining Techniques– Applications – Major Issues in Data mining. Module 2 7 Sessions Data Preprocessing Quiz Problem Solving Topics:Types of data – Data Quality – Data Pre-processing Techniques – Similarity and Dissimilarity measures. Data Mining -Module 3 Assignment Problem Solving 7 Sessions Frequent Patterns Topics: Motivation and terminology: Basic idea - Item sets – Generating frequent item sets and rules efficiently – Apriori Algorithm – FP Growth. Assignment: Apply the Apriori algorithms for finding the frequent Item set in the given TDB. Module 4 Classification 8 Sessions Assignment **Problem Solving** Topics:Basic concepts – Decision tree Induction – Bayes classification methods – Rule based classification – Classification by Back Propagation – Lazy learners. Assignment: 1) Find the Gini Index value of the attributes. 2) Classify the given model using Decision tree algorithm. Cluster Module 5 AnalysisMethods and Assignment Problem Solving 8 Sessions Pattern Mining Topics:Cluster Analysis-Partitioning methods – Hierarchical methods – Basics of Density based method – Pattern mining: A Road Map – Spatial Mining. Assignment: 1) Cluster the objects using Cluster algorithms. 2) Problem for Cluster validation. 3) Apply the Process of data mining in the Employee database. Assignment:

REGISTRAR

Assignments

- 1. From the dataset given, find the Entropy, Gain value of the attributes and also draw the decision tree using entropy for the given dataset.
- 2. Transactional Data Base, D given below which contains set of items find the frequent item set using the Apriori Algorithm and generate the Association Rules. Minimum Support count is 2%. Minimum confidence is 60%.

T _{id}	ltems
10	1, 3, 4
20	2, 3, 5
30	1, 2, 3, 5
40	2, 5

Text Book:

T1. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and Techniques",

Morgan Kaufmann Publishers, Third Edition, 2012.

References:

R1. Tan P. N, Steinbach M and Kumar V, "Introduction to Data Mining", Pearson Education, 2016.

R2. G K Gupta, "Introduction to Data Mining with Case Studies", Third Edition, PHI, 2014.

R3. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw Hill.

Weblinks:

https://onlinecourses.swayam2.ac.in/cec20 cs12/preview

Textbook of Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber and Jian Pei, Morgan Kaufmann Publishers, 2012

https://puniversity.informaticsglobal.com:2284/ehost/detail/detail?vid=7&sid=e2d7362a-fd30-49a9-8f03-

93e963521dbd%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=377411&db=nlebk

(or)

http://182.72.188.195/cgi-bin/koha/opac-

detail.pl?biblionumber=4001&query_desc=ti%2Cwrdl%3A%20Data%20Mining%3A%20Concepts%20and%20Techniqu_es

Topics relevant to development of "EMPLOYABILITY SKILL": Data Mining Techniques, FP Growth.

Catalogue prepared	Dr. GowthulAlam M M	
by		REG
Recommended by	BOS NO: 12th BOS, held on 04/08/2021	erte
the Board of Studies		
on		

1 LUL

Date of Approval by	Academic Council Meeting No. 16, Dated 23/10/2021
the Academic	
Council	

Course Code: CSE2027	Course Title: Fu	undamentals of Data Ana :: Theory only	lytics	L- P- C	3	0	3
Version No.	1.0						
Course Pre- requisites	NIL						
Anti-requisites	NIL						
Course Description	transforming, and supports pre-processin an intuitive w	s of Data Analytics and modeling data with in decision-making. The g, and transformation. ay to analysis the data. e on data analysis to a v	the goal of d course begin It delivers the This course v	iscovering is by coveri e basic stat vill help th	usefu ing Da istics e stuc	l inform ita extra and tau	nation, action, ught in
Course Out Comes	 1) Explain difference 2) Interpret data 3) Apply the Data 4) Demonstrate Illustrate various 	mpletion of the course the s ent types of data and variab a using appropriate statistica a Analysis techniques by M. the collection, processing a s charts using visualization r sion models to analysis of da	iles. al methods. AT Lab nd analysis of d nethods.		given	applicat	ion and
Course Content:							
Module 1	Introduction to Data Analysis	Assignment	Data Collecti	on , data an	alysis	8	B Hours
-		of data analysis: Data in a			-		
		a and Unstructured Data,					
Variables, Central Removing variable		a, Scales of Data, Sources mations.	of Data, Data	preparatior	0	anne	e data,
Module 2	Statistical functions	Assignment	Data analysis	5	REG	1-1	Registrar Hours

Topics: Sampling Techniques: Fundamental Definitions, Important sampling distributions concept of standard error, Descriptive Statistics, Inferential Statistics (T test, Z test,), Probability Uses In Business and Calculating Probability from a Contingency Tables.

within Data, Customizing Gri Importing Unstructured Data Module 4 Data Module 4 Collection Procession of Primary Collection of Data through Structured Data Data Collection of Data through Structured Data Data Collection, Collection of Structured Data Structured Data Module 5 Data Module 5 Data Visual and Collection Prediction Prediction Topics: Types of charts and Analyzing data with pivot tata Tracking trends and making the structure of the structur	ization harting tion, ssing nalysis Data(Observation chedule) Difference condary Data ,Di project project their significance, oles, Build presenta forecasts, Interpret y, Classification	ta, Customizing tt MAT Lab Method, Intervie between Quest ifference between tt MAT Lab to Organize data if ation ready dash tation and repor	, Building a prediction n	3-D Surface plots and ation 8 Hours chrough Questionnaires Other Methods of Data Processing Operations, 12 Hours lizing data with charts, a into business insights,
Module 4Data Collect Proces and ATopics: Collection of Primary ,Collection of Data through Scollection, Collection of Secorrelation.Module 5Data Visual and Cl PredictModule 5Data Visual and Cl PredictTopics: Types of charts and Analyzing data with pivot tak Tracking trends and making in Introduction: Overview prediction Model, SimpleTargeted Application & Topication Area are Decision making in busined	tion, ssing nalysis Data(Observation chedule) Difference econdary Data , Di ization harting their significance, oles, Build presenta forecasts, Interpret y, Classification	n Method, Intervi e between Quest ifference betwe tt MAT Lab Organize data i ation ready dash tation and repor	and data analysis iew Method, Collection of Data the tionnaires and Schedules, Some of een Survey and Experiment P Data analysis with optimization interactively with tables , Visual boards and turn real world data rt writing , Building a prediction n	through Questionnaires Other Methods of Data Processing Operations, 12 Hours lizing data with charts, a into business insights,
Module 4Collect Proces and ATopics: Collection of Primary ,Collection of Data through Sc Collection, Collection of Se correlation.Module 5Data Visual and Cl PredicModule 5Data Visual and Cl PredicTopics: Types of charts and Analyzing data with pivot tak Tracking trends and making in Introduction: Overview prediction Model, SimpleTargeted Application & To Application Area are Decision making in busine	tion, ssing nalysis Data(Observation chedule) Difference econdary Data , Di ization harting their significance, oles, Build presenta forecasts, Interpret	n Method, Intervi e between Quest ifference betwe tt MAT Lab Organize data i ation ready dash tation and repor	and data analysis iew Method, Collection of Data the tionnaires and Schedules, Some of een Survey and Experiment P Data analysis with optimization interactively with tables , Visual boards and turn real world data rt writing , Building a prediction n	through Questionnaires Other Methods of Data Processing Operations, 12 Hours lizing data with charts, a into business insights,
,Collection of Data through S,Collection, Collection of Secorrelation.Module 5Module 5DataVisual and Cl PredicTopics: Types of charts and Analyzing data with pivot tate Tracking trends and making fIntroduction: Overview prediction Model, SimpleTargeted Application & Te Application Area are Decision making in busine	ization harting tion their significance, oles, Build presenta forecasts, Interpret	e between Quest ifference betwe of MAT Lab Organize data i ation ready dash tation and repor	tionnaires and Schedules, Some (een Survey and Experiment P Data analysis with optimization interactively with tables , Visual boards and turn real world data rt writing , Building a prediction n	Other Methods of Data Processing Operations, 12 Hours lizing data with charts, a into business insights,
Module 5 Visual and Cl Predic Topics: Types of charts and Analyzing data with pivot tak Tracking trends and making to Introduction: Overview prediction Model, Simple Targeted Application & To Application Area are Decision making in busing	harting tion their significance, oles, Build presenta forecasts, Interpret , Classification	Organize data i ation ready dash tation and repor , Regression	optimization interactively with tables , Visual boards and turn real world data rt writing , Building a prediction n	lizing data with charts a into business insights
Analyzing data with pivot tak Tracking trends and making Introduction: Overview prediction Model, Simp Targeted Application & To Application Area are Decision making in busing	oles, Build presenta forecasts, Interpret y, Classification	ation ready dash tation and repor , Regression	boards and turn real world data rt writing , Building a prediction n	a into business insights,
Application Area are Decision making in busing			Non Linear Regression.	
			r, Medical diagnosis etc	
Project work/Assignment	: Mention the Ty	/pe of Project /	Assignment proposed for th	is course
analyses using visualization	n any of the bus on. ted to agricultur	siness and ma	ake one objective, collect the and sales and predict the	

	Explo i . Willia	J. Myatt and Wayne P. Johnson, "Making Sense of Data I: A Practical Guide to ratory Data Analysis and Data Mining Paperback", Import, 22 July 2014. m Menke And Joshua Menke,"Environmental Data Analysis with MAT Lab", er, 2012.
Reference	es	
1. Pa	aul McFe	edries, "Excel Data Analysis-visual blue print", Wiley 4 th Edition September 2019.
2. G	erald Kn	ight, "Analyzing Business Data with Excel",O'Reilly; 1 st Edition,13 January 2006.
3. <u>h</u>	ttps://pe	eople.highline.edu/mgirvin/AllClasses/348/348/AllFilesBI348Analytics.htm
4. H	ansa Lys	ander,"Data Analysis and business modelling using Microsoft Excel", PHI, 2017.
•		development of "FOUNDATION SKILLS": Statistical Concepts for data, visualization
technique		<i>"</i>
		"HUMAN VALUES & PROFESSIONAL ETHICS": Data collection for project based
assignme	nts.	
Catalogue		Dr. A Jayachandaran and Dr. R Vignesh
prepared b		
Recommen	· · · · ·	BOS NO: 12th BOS, held on 04/08/2021
the Board		
Studies on		
Date of Ap	-	Academic Council Meeting No. 16, Dated 23/10/2021
by the Aca	demic	
Council		

Course Code:	Course Title: Computer Graphics				
CSE 2066		L-P-C	3	0	3
Version No.	1.0				
Course Pre- requisites	CSE 1002 - Innovation Project -Arduino using C				
Anti-requisites	NIL				
Course Description	The purpose of this introductory course is to discuss the visualization in computer science, enabling students to approximately system displays graphics and visual effects on a display de Theoretical elements, and addresses basic knowledge of	preciate ho evice. This	RAR	rse in	nputer cludes

	Linear Algebra. The course uses assi	gnments to develop vis	sualization skills of
	the students. The key topics covered in	n this course include alg	orithms for drawing
	basic primitives, transformations, view	ing and clipping for both	h 2D and 3D objects
	along with Bezier curves and Surfaces.		
Course Objective	The objective of the course is to develor transformation / Viewing/ Clipping or Learnin		
Course Out Comes	 On successful completion of the course CO 1: Illustrate algorithms for drawin Polygon. CO 2: Illustrate algorithms for perform and clipping. CO 3: Illustrate algorithms for perform clipping. CO 4: Demonstrate plane Bezier curve 	e the students shall be ab g basic primitives like P ning 2D Geometric Tran ning 3D Geometric Tran	oint, Line and sformations, viewing
Course Content:			
Module 1	Overview: Basics of Computer Graphics:	Assignment	No. of Classes : 15

Topics: An Introduction Graphics System : Computer Graphics and Its Types, Application of computer graphics, Graphics Systems : Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Work Stations, Input Devices, Graphics tools and software, Introduction to Visual Studio 17.0 and OpenGL.

Mathematics for Computer Graphics, Introduction to linear algebra, Matrix, Matrix Equations, Linear equation, Quadratic equation, Calculus, differential geometry. Line drawing algorithms (DDA, Bresenham's), circle generation algorithms (Bresenham's). Basics of 2D and 3D objects.

Assignment: Numerical problems based on Matrix equations, Linear equation, Quadratic equation, Calculus, differential geometry.

Module 2	2D Geometric Transformations, viewing and clipping:	Assignment	No. of Classes : 12
	rmations: Basics of translation, scalin	•	1
homogeneous coordin	ates for translation, scaling and rotation.	2D Composite transform	nations, General pivot
point rotation and scal	ling, OpenGL geometric transformations	s functions.	0
Basics of 2D viewing	and Clipping: Basics of viewing and	d Clipping, 2D viewin	ig nipeline, Viewing
Transformation system	ms, Types of clipping: point, Line and p	olygon clipping, 2D line	e cupping algorithms:
cohen-sutherland line	clipping, Liang-Barsky line clipping alg	orithm, polygon fill area	clipping: Sutherland-
	lipping algorithm, OpenGL 2D viewing		* BANGALOR

Module 3	3D Geometric Transformations, clipping:	Assignment	No. of Classes : 9
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3DGeometric Transformations: 3D translation, rotation, scaling, composite 3D transformations, OpenGL 3D geometric transformations functions.

Basics of 3D Viewing and Clipping: 3D viewing concepts, 3D viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformation, orthogonal projections, perspective projections, Three dimensional line and polygon clipping.

Assignment: Numerical problems based on 2D and 3D transformations.

Module 4	Plane curves and surfaces	Assignment	No. of Classes : 9

Plane Curves: Plane Curves representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Parametric Representation of an Ellipse, Parametric Representation of a Parabola, Parametric Representation of a Hyperbola, A Procedure for using Conic Sections, The General Conic Equation,

Basics of Surfaces Curve: Representation of Space Curves, Cubic Splines, Bezier Curves, Parametric Cubic Curves, Quadric Surfaces, Bezier Surfaces.

Targeted Application & Tools that can be used:

Application Area: Game design and Animation

Tools/Simulator/Software used: Visual Studio 17.0

Text Book:

T1: Donald D. Hearn, M. Pauline Baker and Warren Carither, Computer Graphics with OpenGL, Pearson Education, 4th Edition, 2021

Reference Books:

- R1. John F Hughes, Andries van Dam, Steven K. Feiner, James D. Foley, Morga, Computer Graphics: Principles and Practice, Pearson Education India, Third Edition, 2013
- R2. John Kessenich, Graham Sellers, Dave Shreiner, OpenGL Programming guide, Addison-Wesley Ninth Edition, 2016
- R3. Edward Angel and Dave shreiner, Interactive Computer Graphics, A top down approach with shader based OpenGL, Pearson Education, 6th Edition, 2018

Catalogue prepared by	Prof. Uday Kumar Singh
	BOS NO: 13 th BOS, held on 08/12/2021
Board of Studies on	PECISTRAP STOCY UNIT

Date of Approval by	Academic Council Meeting No. 17, Dated 11/12/2021
the Academic	
Council	

Course Code: CSE2067	Course Title: Web Type of Course: P	•••			2	2	3
		egrated Laboratory		L- P- C			
Version No.	1.0						
Course Pre-	NIL						
requisites							
Anti-requisites	NIL						
Course Description	scripting langua	the course is to prov ages that are used for laboratory provides	creating web-l	based ap	plication	ons.	cepts
		tical thinking and ar		1			1
Course Objective	This course is design <u>LEARNING</u> techniqu	ned to improve the lear les.	ners' <u>EMPLOYABII</u>	ITY SKILL	<u>5</u> by usir	ng <u>EXPEF</u>	RIENTIAL
Course	On successful co	mpletion of this co	urse the studer	nts shall	be abl	e to:	
Outcomes		web-based applicat					ges.
	(Application leve	el)					
		ous constructs to enl	nance the appe	arance c	of a we	bsite.	
	(Application leve	•					
		er-side scripting lang	guages to devel	op a wel	o page	linked	to a
Course Content:	database. (Appli	cation level)					
course content.							
Module 1	Introduction to XHTML	Quizzes and Assignments	Quizzes on of XHTML, s applications	imple	atures	10	Classes
Topics:							
Basics: Web, W	WW, Web browse	rs, Web servers, Inte	rnet.		0		
	ture, Basic Text N	of HTML and X Iarkup, Images, Hyp					

			Comprehension based	
		Quizzes and	Quizzes and assignments;	
Module 2	Advanced CSS	assignments	Application of CSS in	12 Classes
		assignments	designing webpages	
Advanced CSS	I avout Normal Ele	l Ny Docitioning Elon		ructing
	: Layout, Normal Fic	w, Positioning Eler	nents, Floating Elements, Const	ructing
Multicolumn.				
	paches to CSS Layou			
XML: Basics, d	emonstration of app	plications using XM	L	
	PHP –	Outersaland	Application of DUD in woh	
Module 3	Application	Quizzes and	Application of PHP in web	14 Classe
	Level	assignments	designing	
Topics:				
		•	HP, Arrays, and Superglobals, A	• •
			Files Array, Reading/Writing File	
Classes and Ob	ojects, Object, Classe	es and Objects in Pl	HP, Object Oriented Design, Wo	rking with
Databases, SQ	L, Database APIs, M	anaging a MySQL D	atabase. Accessing MySQL in PH	HP.
List of Laborato	ory Tasks:	···	<u>_</u>	
	•			
Experiment No.	. 1: Demonstration of	XH I WIL Teatures		
Experiment No.	. 1: Demonstration of	XHTML features		
-			1)	
Level 1: Demo	nstration of various	XHTML Tags (Level	•	
Level 1: Demo	nstration of various	XHTML Tags (Level	1) nline Book store (Level 2).	
Level 1: Demo Level 2: Desigr	nstration of various and develop static	XHTML Tags (Level web pages for an c	nline Book store (Level 2).	
Level 1: Demo Level 2: Desigr Experiment N	nstration of various and develop static o. 2: Application of	XHTML Tags (Level web pages for an c CSS in web designi	nline Book store (Level 2). ng	line
Level 1: Demo Level 2: Desigr Experiment N Level 1: Desig	nstration of various and develop static o. 2: Application of n a document using	XHTML Tags (Level web pages for an c CSS in web designi	nline Book store (Level 2).	line
Level 1: Demo Level 2: Design Experiment N Level 1: Desig electronic sho	nstration of various and develop static o. 2: Application of n a document using pping.	XHTML Tags (Level web pages for an c CSS in web designi XHTML and CSS to	nline Book store (Level 2). ng create a catalog of items for on	
Level 1: Demo Level 2: Design Experiment N Level 1: Desig electronic sho	nstration of various and develop static o. 2: Application of n a document using pping. e and save XML doc	XHTML Tags (Level web pages for an c CSS in web designi XHTML and CSS to	nline Book store (Level 2). ng	
Level 1: Demo Level 2: Design Experiment N Level 1: Desig electronic sho Level 2: Creat cascaded style Experiment N	nstration of various and develop static o. 2: Application of n a document using pping. e and save XML doc e sheet. o. 3: Application of	XHTML Tags (Level web pages for an c CSS in web designi XHTML and CSS to ument for students PHP in web design	nline Book store (Level 2). ng create a catalog of items for on ' information and display the sa ing.	ime using
Level 1: Demo Level 2: Design Experiment N Level 1: Desig electronic sho Level 2: Creat cascaded style Experiment N	nstration of various and develop static o. 2: Application of n a document using pping. e and save XML doc e sheet. o. 3: Application of	XHTML Tags (Level web pages for an c CSS in web designi XHTML and CSS to ument for students PHP in web design	nline Book store (Level 2). ng create a catalog of items for on ' information and display the sa	ime using
Level 1: Demo Level 2: Design Experiment No Level 1: Design electronic sho Level 2: Creat cascaded style Experiment No Level 1: Write last name, age	nstration of various and develop static o. 2: Application of n a document using pping. e and save XML doc e sheet. o. 3: Application of a PHP program to re e, permanent addres	XHTML Tags (Level web pages for an o CSS in web designi XHTML and CSS to ument for students PHP in web design ead the personal in s, and pin code ent	nline Book store (Level 2). ng create a catalog of items for on ' information and display the sa ing. formation of a person such as fi ered by the user into a table cre	ime using rst name, eated in
Level 1: Demo Level 2: Design Experiment No Level 1: Design electronic sho Level 2: Creat cascaded style Experiment No Level 1: Write last name, age MySQL. Read to	nstration of various and develop static o. 2: Application of n a document using pping. e and save XML doc sheet. o. 3: Application of a PHP program to re permanent address the same informatio	XHTML Tags (Level web pages for an o CSS in web designi XHTML and CSS to ument for students PHP in web design ead the personal in s, and pin code ent on from the databas	nline Book store (Level 2). ng create a catalog of items for on ' information and display the sa ing. formation of a person such as fi ered by the user into a table creater is and display it on the front end	ime using rst name, eated in d.
Level 1: Demo Level 2: Design Experiment N Level 1: Designelectronic sho Level 2: Creat cascaded style Experiment N Level 1: Write last name, age MySQL. Read t Level 2: Using	nstration of various and develop static o. 2: Application of n a document using pping. e and save XML doc e sheet. o. 3: Application of a PHP program to re e, permanent address the same informatio PHP develop a web	XHTML Tags (Level web pages for an o CSS in web designi XHTML and CSS to ument for students PHP in web design ead the personal in s, and pin code ent on from the databas page that accepts b	nline Book store (Level 2). ng create a catalog of items for on ' information and display the sa ing. formation of a person such as fi ered by the user into a table cre se and display it on the front end book information such as ISBN n	ime using rst name, eated in d. umber, title,
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1] Robert. W. Sebesta, "*Programming the World Wide Web*", Pearson Education, 8th Edition, 2015.

2] *CSS Notes for Professionals*, ebook available at https://books.goalkicker.com/CSSBook/ (Retrieved on Jan. 20, 2022)

3] Deitel, Deitel, Goldberg,"*Internet & World Wide Web How to Program*", Fifth Edition, Pearson

Education, 2021.

References

1] Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson Education India, 1st. Edition.2016.

2] Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson Education, 1st Edition, 2016.

Topics related to development of "FOUNDATION": Web, WWW, Web browsers, Web servers, Internet. Topics related to development of "EMPLOYABILITY": CSS, PHP.

Topics related to development of "HUMAN VALUES AND PROFESSIONAL ETHICS": Web designing for healthcare.							
Catalogue	Dr. Shankar K. Ghosh, Jobin Thomas.						
prepared by							
Recommended by	BOS NO: 12th BOS, held on 04/08/2021						
the Board of							
Studies on							
Date of Approval	Academic Council Meeting No. 16, Dated 23/10/2021						
by the Academic							
Council							

Course Code: CSE3001	Course Title: Introduction to Artificial Intelligence and Machine Learning Type of Course:1]Program Core 2] Laboratory integrated	L-P-C	2	2	3				
Version No.	1.0								
Course Pre- requisites	CSE1003 Innovation Project - Raspberry Pi Using Python								
Anti-requisites	NIL								
Course Description	This course introduces the basic concepts of artificial intelligence. It introduces students to the basic concepts and techniques of Machine Learning (ML), a subset of Artificial Intelligence (AI), is an important set of techniques and algorithms used for solving several business and social problems. The objective of this course is to discuss machine learning model development using Python. Topics include: Working with Collections and Data Frames; Regression algorithms; Classification algorithms; Optimization techniques – Gradient Descent algorithm, Gradient Descent for simple Linear Regression; Ensemble Learning – Random Forest, Boosting techniques Hada Boost, and Gradient Boosting; Grid Search for optimal parameters; Clustering algorithms; Forecasting with								

	: Association Rule Mining, Collaborative Filtering, Text Analytics – Sentiment Classification using Naïve Bayesian model.								
Course Out Comes	 To develop a terms of inte Produce mac Apply ensem machine lear Demonstrate 	lligent agents. (KNOWL hine learning models for ble learning, optimization ning algorithms. e different types of clust series forecasting technology	the building blocks of AI as pre EDGE) or predictive analytics. (Applic on and hyper parameter tuning (Application)	ation) techniques for ication)					
Course Content:									
Module 1	Introduction to Artificial Intelligence and Knowledge based systems	Assignment	Theory	6Hours(6L)					
Structure of Intellige	ent agent and its fun ues in knowledge re	ctions, Agents and Enviro presentation, Knowledge	istory and Applications; Agents: nment; Introduction to Knowledg -based agent and its Structure, I	e representation,					
Module 2	Supervised Machine Learning Algorithms	Assignment	Programming activity	16 Hours(8L,8 P)					
One-hot encoding, S measures for Regree measures of node in Cohen's Kappa St	imple Linear Regress ssion models. Classi npurity, model evalu atistic, Multi-class	sion, Multiple Linear Regi fication models – Decisio ation metrics for classifica	s Imbalance problem. Naïve B	ion and Accuracy and Gini Index as					
Module 3	Advanced Machine Learning Concepts	Assignment	Programming activity	14Hours(8L 6P)					
	. ·		nization Technique – introduct arning algorithms – Bagging (I						

Boosting(AdaBoost), Hyper parameter Tuning for nearest neighbor learning using Grid Search. Introduction to Regularization with Advanced Regression models- LASSO and Ridge Regression an introduction.

	Clustering and			10
Module 4	Forecasting with	Assignment	Programming activity	Hours(6L,4
	Time-Series Data			P)

Topics:

Partitioned Clustering – K-means and Hierarchical Clustering techniques, cluster validity measures, Components of Time Series data, forecasting using moving average, exponential smoothing, calculating forecast accuracy, decomposing time series data, auto-regressive integrated moving average models(ARIMA). Association Rule Mining, Collaborative Filtering – User based and item based similarity

List of Laboratory Tasks:

Lab sheet -1

Level 1: A review of Python programming - Introduction to Python Stack for Data Science, Core Python Libraries for data analysis, Anaconda platform and its installation, Executing programs on Jupyter IDE/ Colab.

Level2: Programming exercises to revise variables, control statements and collections – lists, list comprehension

Lab sheet -2

Level 1 - Programming exercises on Tuples

Level 2- Nested data structures

Lab sheet -3

Level 1: Introduction to Numpy, Pandas,

Level 2: Scikit-learn and Visualization techniques.

Lab sheet -4

Level 1 - Dictionaries, dictionary comprehension.

Level 2 - Introduction to Data Frames using Pandas and working with frames

Lab sheet -5

Level 1- Regression Models Simple linear regression, outlier detection.

Level 2 - multiple linear regressions – model evaluation, multi-co linearity and handling multi-co linearity, outlier detection.

Lab sheet -6

Level 1- Decision Tree Classifiers - Decision Tree classifier using Gini Index- measuring test accuracy, displaying the tree, confusion matrix and ROC.

Level 2- Decision Tree Classifier using Entropy.

Lab sheet -7

Level 1 - Optimization Techniques Developing a Gradient Descent Algorithm for linear regression – using NumPy and using sklearn.

Level 2 - cohen_kappa_score.

Lab sheet -8

REGISTRAR

Registra

Level 1- Hyper parameter Tuning methods Hyper parameter tuning using Grid Search for Nearest
 Neighbor Classifiers and
 Level 2- Hyper parameter tuning using Grid Search for Decision Tree Classifiers.

Lab sheet -9

Level 1 - Hyper parameter Tuning for Ensemble models Ensemble Learning – Random Forest – Building the model, Grid Search for optimal parameters,

Level 2 - Feature Importance. Ada Boost Classifiers and Gradient Boosting Classifiers

Lab sheet -10

Level 2 - Clustering – Kmeans – cluster centers and interpreting the clusters, finding the optimal number of clusters using Elbow Curve method.

Level 2 - Agglomerative Hierarchical Clustering – Compare the clusters formed by kmeans and Agglomerative Clustering

Lab sheet -11

Level 1 – Probability theory(Conditional Probability)

Level 2 - Naïve Bayes Model

Lab sheet -12

Level 1- Models forecasting Applications

Level 2 - Models for Forecasting Time Series data

Lab sheet -1 3

Level 1- Recommender Systems - Association Rule Mining using Apriori for frequent Itemset Generation. Level 2 - Recommender Systems – user based similarity

Targeted Application & Tools that can be used: Use of PowerPoint software for lecture slides and use of Google's Colab cloud service <u>https://www.tutorialspoint.com/google_colab/index.html</u> for executing and sharing of lab exercises.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

5] Programming: Implementation of given scenario using Python and Colab.

6] Assignment: Learning courses for 4 Hours from the following link <u>https://learn.datacamp.com/courses?topics=Machine%20Learning</u>

Text Book

- 1. Andreas C Muller, Sarah Guido, "Introduction to Machine Learning with Python : A Guide for Data Scientists", Oreilly, First Edition, 2016
- 2. Stuart J. Russell and Peter Norvig, Artificial intelligence: A Modern Approach, 3rd edition, Upper Saddle River, Prentice Hall.

References

- 1. Tan P. N., Steinbach M & Kumar V. "Introduction to Data Mining", Pearson Education, 2016.
- 2. Giuseppe Bonaccorso, "Machine Learning Algorithms: A reference guide to popular algorithms from data science and machine learning", Packt Publishing, 2017.
- 3. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning Using Python", Wiley, First Edition 2019.

		James 131 Vie
Catalogue	Dr. Aditya K Saxena and Dr. Sandeep	Registrar
prepared by		BANGALORE.

Recommended by	BOS NO: 12th BOS, held on 04/08/2021
the Board of	
Studies on	
Date of Approval	Academic Council Meeting No. 16, Dated 23/10/2021
by the Academic	
Council	

Course Code: CSE3082	Course Title: Object Orien		Design with UML	L- P- C	3	0	3				
Version No.	1.0										
Course Pre- requisites	CSE 1001 Java Programm	ing									
Anti-requisites	NIL										
Course Description	This course covers the analysis and design methodology in sufficient depth to convey a good understanding of object-oriented analysis and design using the unified process. Students will be able to design a use case model, identify the classes and their responsibilities, use interaction models to capture the interdependence among objects/classes and design an efficient solution. The application of the design axioms and the iterative nature of the process are emphasized. This course will enable students to apply object oriented concepts in all the stages of the software development life cycle.										
Course objective	This course is designe	d to improve th	ne learners " Sk	ILL DEV	ELC	DPIV	1ENT "by				
	using EXPERIENTIAL L	using EXPERIENTIAL LEARNING techniques.									
Course	On successful completion of										
Outcomes	1]Describe the basics of obje	-									
	2]Identify the various te [Comprehension]	configues for obj	ect-oriented anal	lysis tech	niq	ues					
	3] Apply the design axioms to create appropriate UML diagrams. [Application]										
	4]Apply the design process to develop implementation models.										
	[Application]										
Course Content:											
Module 1	Introduction to Object oriented Ass system	signment	Identify probler objects for an domain	n domai applicatic	au	R	Classes				

Topics:

Object Basics-Object Oriented System Development Life Cycle- Use case driven approach-Rumbaugh Object Model- Booch Methodology-Jacobson Methodology-Unified Approach, Static and Dynamic Modeling-Unified Modeling Language

Module 2	Object analysis	oriented	Assignment	Identifica classes	tion of a using	candidate various	10 Classes
	analysis		approach	es			

Topics:

Identifying use cases-Object Analysis-Classification: Theory-Approaches for Identifying Classes: Noun Phrase approach, Common Class pattern approach, Use case driven approach, Classes, Responsibilities and Collaborators- Identifying Object relationships: Associations, Super–sub class relationships, Aggregation. UML diagrams: Use case Diagram, Class diagram.

Module 3	Introduction t axiomatic design	to	Assignment	Apply axioms to create class diagram	10 Classes
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Topics:

Object Oriented Design Axioms-Designing Classes -Class visibility -Redefining attributes -Designing methods and protocols -Packages and managing classes, UML Diagrams: Interaction diagram, Sequence diagram, Collaboration diagram, State-chart diagram, Activity diagram

Topics:

Access Layer- Object Storage Persistence - Object oriented Database System-Designing view layer classes -Macro level process -Micro level process- Prototyping the user interface UML diagrams: component diagram, Deployment diagram, Quality Assurance Tests-Testing Strategies.

Tools that can be used:

Tools:

- Microsoft visio, Rational software architect(RSA)
- ArgoUML, Rational Rose, StarUML, Umbrello

Project work/Assignment:

Term Assignments:

- identify Use Cases and develop the Use Case model
- Identity the conceptual classes and develop a UML Class diagram
- Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams
- Identify the business activities and develop an UML Activity diagram

Text Book

1. Ali Behrami, "Object Oriented Systems Development using Unified Modeling Language" McGraw Hill International Edition, July 2017.

References

1. Craig Larman, "Applying UML and Patterns", Pearson Education.

2.Grady Booch, "Object Oriented Analysis and Design with Applications", Addison-Wesly.

3.Simon Bennett, Steve McRobb, Ray Farmer, "Object Oriented Systems Analysis and Design using UML", McGrawHill Education

Topics related to development of "FOUNDATION": Object Basics-Object Oriented System Development Life Cycle- Use case driven approach-Rumbaugh Object Model- Booch Methodology-Jacobson Methodology-Unified Approach, Static and Dynamic Modeling-Unified Modeling Language

Topics related to development of "SKILL DEVELOPMENT": UML diagrams: Use case Diagram, Class diagram, Interaction diagram, Sequence diagram, Collaboration diagram, State-chart diagram, Activity diagram, component diagram, Deployment diagram using the tool StarUML software

Catalogue	Dr. Clara Kanmani A
prepared by	
Recommended by	BOS NO: 12th BOS, held on 04/08/2021
the Board of	
Studies on	
Date of Approval	Academic Council Meeting No. 16, Dated 23/10/2021
by the Academic	
Council	

	Course Title: Cryptography and Network Security			1 wille
Course Code:	course mile. Cryptography and Network Security	L- P- C	3	Q FEICY UN 3
CSE 3078	Type of Course: Program Core & Theory only		REC	STRAR
Version No.	1			BANGALOKE

Course Pre- requisites	"Data Communications an	d Computer Networ	'ks''.		
Anti-requisites	NIL				
Course Description	The Course covers the principles and practice of cryptography and network security, focusing in particular on the security aspects of the web and Internet. Topics : The cryptographic tools such as shared key encryption, public key encryption, key exchange, and digital signature are explored. The use and utilization of the internet protocols and applications such as SSL/ TLS, IPSEC, Kerberos, PGP, and S/ MIME, SET are reviewed. System security issues such as viruses, intrusion and firewalls are also explored.				
Course Objective	The objective of the cou LEARNING techniques.	rse is SKILL DEVEI	LOPMENT of student by using F	PARTICIPATIVE	
Course Outcomes	CO3: Recognize the Pr (Comprehension)	oncept of Cryptogra types of Cryptogra ublic key Cryptog security concepts c		applications.	
Course Content:					
Module 1	Introduction to Cryptography	Assignment	Identify the Concepts	08 Sessions	
passive attacks, servic Substitution Ciphers : Ca Stream Cipher, Festal St	ces: Authentication, Access aesar, Mono alphabetic, Poly cructure. Private Key Cryptography and	s Control, Data C	ity architecture, Security Attacks Confidentiality, Data Integrity, I ir and Hill Cipher, Introduction to B Analysis of requirement of complexity in cryptography	Nonrepudiation,	
Encryption Standar primality testing and	d, Modular Arithmetic	c, Prime numbe Logarithmic Pro	rd, Introduction to Galois Fie ers, Fermat's little theorem oblem, Euclidean and Extend orem	, brief about	
Module 3	Public Key Cryptography and its Applications	Assignment	Recognize the importance of various security concerts to achieve sufficient solutions	112 Sessions	
Topics:				ANGALOK*	

Overview of Public Key Cryptography, RSA, Diffie - Helman Key exchange, Man in the middle attack, Cryptographic Hash functions, Secure Hash Algorithm, Message Authentication Codes – HMAC, Digital Signature, Discussion on real time practices of Cryptography.

Module 4	Network Security	Assignment	Implement the advanced network security algorithms in recent applications.	07 Sessions
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Topics:

Network Security fundamentals, Network Security applications: Authentication: Kerberos, PKI, Network Security applications: e-mail security: PGP, MIME, Network Security applications: IP Security: IP Sec architecture, Network Security applications: Web Security.

Targeted Application & Tools that can be used:

Students get the knowledge about cryptography techniques followed, the algorithms used for encryption and decryptions & the techniques for authentication and confidentiality of messages.

Assignment:

Assignment 1: Solve the problems of basic encryption techniques.

Assignment 2: Solve and analyze the problems on symmetric and asymmetric encryption.

Textbooks:

1. William Stallings, "Cryptography and Network Security - Principles and Practices", Prentice Hall, 8th Edition,

2019.

2. Wade Trappe and Lawrence C Washington, "Introduction to Cryptography with Coding Theory", Pearson,

2020.

Reference Books:

1.Behrouz A Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", McGraw Hill, third edition, 2010.

2. R.Rajaram, "Network Security and Cryptography" SciTech Publication.3rd Edition, 2014.

3. AtulKahate, "Cryptography and Network Security", Tata McGraw-Hill, 2nd Edition, 2019.

4. BruceSchneier, "Applied Cryptography", John Wiley and Sons Inc. Second Edition, 2015.

Web references:

1.<u>https://onlinecourses.nptel.ac.in/noc22_cs90/preview</u>

2.e-pgpathshala UGC lecture series : E-Series and Self learning Materials.

https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==

3. http://182.72.188.195/cgi-bin/koha/opac-

detail.pl?biblionumber=10133&query_desc=kw%2Cwrdl%3A%20Cryptography%20and%20Network%20Security

4.http://182.72.188.195/cgi-bin/koha/opac-

detail.pl?biblionumber=5875&query_desc=kw%2Cwrdl%3A%20Cryptography%20and%20Network%20Security.

Topics relevant to "Skill Development": Symmetric and Asymmetric Encryption Algorithms and its problems.

Catalogue prepared by Dr.A. Vijayakumar

Recommended by the	BOS NO: 12th BOS, held on 04/08/2021
Board of Studies on	
Date of Approval by	Academic Council Meeting No. 16, Dated 23/10/2021
the Academic Council	

Course Code: ECE2007	Course Title:Digital DesignType of Course:Program Core		L- P- C	2	2	3	
	Theory & Integrated I	aboratory					
Version No.	1.0						
Course Pre- requisites	Basic concepts of number representation	, Boolean Algebra	ı, Arithmetic	and Logi	c Compu	itation.	
Anti-requisites	NIL	NIL					
Course Description	The purpose of this course is to enable logic circuits and Boolean algebra for circuits. The course emphasizes on mi cost digital circuit implementations. The electronic circuits. The course also cr Computer Architecture, Microprocess The course enhances the Design, Impler tasks. The associated laboratory provide	ocusing on both nimization techni This course deals eates a foundatio sors, Microcontro mentation and Pro	combinatio iques for ma with analy on for futur ollers, and E gramming a	nal and s aking can sis and d e courses mbedded bilities thr	equentia onical an esign of which in System ough lab	al logic nd low- digital ncludes s etc. poratory	
<mark>Course</mark> Objective	The objective of the course is <u>SKILL</u> <u>PARTICIPATIVE LEARNING</u> techn		<mark>f of the stuc</mark>	lent by us	ing		
Course	On successful completion of this cours	e the students sha	all be able t	0:			
Outcomes	i. Discuss the concepts of num				gic gate	s.	
	ii. Apply minimization techniq	•	•				
			-				
	iv Illustrate the Sequential and		logic circui	ts			
		l programmable					
	v. Implement various combina	l programmable	uits using g	ates.	gates.		
Course Content:		l programmable	uits using g	ates.	gates.		
Course Content: Module 1	 v. Implement various combination view of various combination view of various combination view of various combination view of various various combination view of various combinatio view of various combination view of various combination view	l programmable	uits using g	ates. its using		ession	
Module 1	v. Implement various combina vi. Verify the performance of various Fundamentals of Number	l programmable ational logic circu arious sequential Application	uits using g logic circu Data Ana	ates. its using		ession	
Module 1 Topics:	 v. Implement various combination view of various combination view of various combination view of various combination view of various various combination view of various combinatio view of various combination view of various combination view	l programmable ational logic circu arious sequential Application Assignment	Lits using g logic circu Data Ana task	ates. its using alysis	6 S		
Module 1 Topics: Review of Number s Boolean algebra, Bo variable K-Maps, ut	 v. Implement various combinativity. Verify the performance of variation variation. Fundamentals of Number systems- Boolean algebra and digital logic systems, Number base conversions, complete polean functions- canonical and standard filizing Don't care conditions. Quine McChina Standard Market Standard Standard Market Standard Standard Market Standard Standard Market Standard Market Standard Standard Market Standard Mar	Application Assignment ements of numbers orms, Digital logic	Data Ana task , Binary Coc c gates, Inti	ates. <u>its using</u> alysis les, Boole oduction,	6 Se an theore two, thr	ems and ee, four	
Module 1 Topics: Review of Number s Boolean algebra, Bo	 v. Implement various combinativity. Verify the performance of variation variation. Fundamentals of Number systems- Boolean algebra and digital logic systems, Number base conversions, complete polean functions- canonical and standard filizing Don't care conditions. Quine McChina Standard Market Standard Standard Market Standard Standard Market Standard Standard Market Standard Market Standard Standard Market Standard Mar	Application Assignment ements of numbers orms, Digital logic	Data Ana task , Binary Coc c gates, Inti	ates. its using alysis les, Boole oduction, . Universe	6 Se an theore two, thr	ems and ee, four NAND	

Topics:

Introduction to Combinational circuits, Analysis, Design procedure, Binary Adder and Subtractor, Magnitude comparator, Multiplexers-Demultiplexers, Decoders, Encoders and Priority Encoders, HDL Models of combinational circuits.

Module 3	Sequential and Programmable logic circuits:	Application Assignment	Programming Task & Data Analysis task	14 Session
----------	---	---------------------------	---	------------

Topics:

Introduction to sequential circuits, Storage elements: latches and flip flops, Characteristic tables and equations, excitation table, Analysis of clocked sequential circuits, Mealy & Moore Models of finite state machines - Registers & Counters - HDL Models of Sequential circuits- ROMs, PLDs & PLAs. Implementation of Digital circuits.

List of Laboratory Tasks:

Experiment N0 1: Verify the Logic Gates truth table

Level 1: Verify basic logic gates on Digital Logic Trainer kit.

Level 2: Construct basic logic gates using universal gates and verify using Digital Logic Trainer kit.

Experiment No. 2: Verify the Boolean Function and Rules **Level 1:** Verify basic Boolean laws on Digital Logic Trainer kit.

Level 2: Construct a circuit to verify De Morgan's Theorem on Digital Logic Trainer kit.

Experiment No. 3: Construct and verify the HA/FA logic circuits **Level 1:** By using basic logic and XOR gates and Trainer Kit. **Level 2:** By using Universal logic gates and Trainer Kit

Experiment No. 4: Construct and verify the HS/FS logic circuits **Level 1:** By using basic logic and XOR gates and Trainer Kit **Level 2:** By using Universal logic gates and Trainer Kit

Experiment No. 5: Construct and verify the combinational logic circuit for given specifications.Level 1: Specifications given in the form of Truth table. Implement using basic gates.Level 2: Specification should be extracted from the given scenario. Implement using universal gates only.

Experiment No. 6: Study of SR and D Flip flopsLevel 1: Verify the operation of SR and D Flip-Flops on Digital Logic Trainer kitLevel 2: Construct and verify a SR Flip Flop using D Flip Flops.

Experiment No. 7: Study of JK Flip-flop and Toggle Flip-Flop.Level 1: Verify the operation of JK Flip-flop and Toggle Flip-Flop on Digital Logic Trainer kitLevel 2: Construct and verify a T Flip-Flop using JK Flip-Flop.

Experiment No. 8: Construct and verify the sequential logic circuit for given specificationsLevel 1: Specifications given in the form of Truth table.Level 2: Specification should be extracted from the given scenario.

Experiment No. 9: Write the HDL coding for basic combinational logic circuitsLevel 1: Gate level ModelingLevel 2: Behavioral Modeling

Experiment No. 10: Write the HDL coding for basic sequential logic circuitLevel 1: Gate level ModelingLevel 2: Behavioral Modeling



Targeted Application & Tools that can be used:

Application Area includes all modern electronic devices (cellular phones, MP3 players, laptop computers, digital cameras, high definition televisions, Home Automation, Communication systems). The students will be able to join a profession which involves basics to high level of digital circuit design and analysis.

Professionally Used Software: HDL (VHDL/ Verilog HDL)/ C++

Besides these software tools Digital IC Trainer kit and Integrated Circuits (ICs) can be used to perform circuit testing and analysis.

Project work/Assignment:

1. Case Studies: At the end of the course students will be given a real-world scenario for any application like security system/digital clock/ 7segment disply. Students will be submitting a report which will include Truth table, Design, Circuit Diagrams, implementation and Results.

2. Book/Article review: At the end of each module a book reference or an article topic will be given to each student. They need to visit the library and write a report on their understanding about the assigned article in an appropriate format. <u>Presidency University Library Link</u>.

3. Presentation: There will be a group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.

4.Assignment 1: Raj is an engineering student. In his mini project, he has to design a circuit which has three inputs A, B, Cin and Two outputs. The circuit performing the summations of all input and produce sum and carry output. But Raj has only 3 into 8 line Decoder IC. Give the truth table and circuit diagram for his project with available Decoder: **5.Assignment 2:** A student wants to design a digital logic switching function which is described by the following Boolean Function in SoP, $F(A,B,C,D)=\sum(1,3,4,11,12,13,14,15)$. But he has provided with only 8x1 MUX. Guide the student to design the switching function using MUX only

Text Book(s):

- 1. Mano, M. Morris and Ciletti Michael D., "Digital Design", Pearson Education, 6th edition
- 2. Thomas L. Floyd "DIGITAL LOGIC DESIGN", Pearson Education, fourth edition.

REGISTRAR

Reference(s): Reference Book(s):	
	"Modern Digital Electronics", McGraw Hill Education (India), 4th Edition
R2. Roth, Charle Edition	es H., Jr and Kinney Larry L., "Fundamentals of logic Design", Cengage Learning, 7th
(studymate 1. eBook1: M 2. {[PDF] Di 3. eBook2:Fl LOGIC DE 4. 4. NPTEL Co 5. Digital Log 6. Lab Tutori E-content: 1. Z. Xin-Li Communic Mechatron 2. An encodi Bhadra;Tar	 e-books, notes, ppts, video lectures etc.): Book Free Download frialz.in) fano, M. Morris and Ciletti Michael D., "Digital Design", Pearson Education. igital Design By M. Morris Mano, Michael D Ciletti Book Free Download oyd "DIGITAL LOGIC DESIGN" fourth edition- ePub, eBook- [PDF] DIGITAL ESIGN FOURTH EDITION FLOYD abri.engenderhealth.org. burse-<u>NPTEL</u>:: Electrical Engineering - NOC:Digital Electronic Circuits gic Design PPT <u>Slide 1 (iare.ac.in)</u> al: <u>Multisim Tutorial for Digital Circuits - Bing video</u> <u>CircuitVerse - Digital Circuit Simulator online</u> Learn Logisim → Beginners Tutorial Easy Explanation! - Bing video Digital Design 5: LOGISIM Tutorial & Demo and W. Hong-Ying, "The Application of Digital Electronics in Networking eation," 2016 Eighth International Conference on Measuring Technology and ics Automation (ICMTMA), 2016, pp. 684-687, doi: 10.1109/ICMTMA.2016.168. ing technique for design and optimization of combinational logic circuit Dipayan nvir Ahmed Tarique;Sultan Uddin Ahmed;Md. Shahjahan;Kazuyuki Murase 2010 13th al Conference on Computer and Information Technology (ICCIT)
Generation	ova and V. Provkin, "Applying Incompletely Specified Boolean Functions for Patch Circuit n," 2021 IEEE East-West Design & Test Symposium (EWDTS), 2021, pp. 1-4, doi: WDTS52692.2021.9581029.
Topics related to dev Counters and Register	relopment of "FOUNDATION SKILLS": Adders, Multiplexers, Decoders / Encoders; Flip-Flops, ers.
Catalogue	Dr. G. Muthupandi
prepared by	
Recommended by the Board of Studies on	BOS NO: 19th BOS, held on 04/08/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/8/2022.

			anne
Course Code: CSE2020	Course Title: Blockchain Technology and Applications Type of Course: Program Core	L-P-C	3 0 REGISTRAR
Version No.	1.0		EANGALOE

Course Pre- requisites	Fundamentals of Blockch	ain Technology		
Anti-requisites	NIL			
Course Description	specific focus on indus chain management, ag	trial applications like Blo riculture industry, Healt schain technology, Stude	troduction to Blockchain tec ockchain in Financial system, hcare sectors and Insurance ents will learn how these syst	trade/supply system. With
Course Objectives	This course is designed learning techniques	to improve the learner	s employability skills by using	g experiential
Course Out Comes	 Understand th Explain the me (Comprehension) Explore the use 	e concepts of Blockchair thods for verification ar on). e the Ethereum program	rse the students shall be able n technology (Knowledge). nd validation of Bitcoin transa nming (Application). pus domain (Comprehension)	actions
Course Content:				
Module 1	Introduction to Blockchain	Quiz	Knowledge based quiz on Cryptographic Hash Functions	No. of Classes:8
	nent Services, Transactio		ot and Cold Storage, Online Hash Functions, Hash Pointe	
Module 2	Bitcoin	Assignment	Bitcoin mining pools	No. of Classes:10
	Bitcoin netw The task of Bitcoin miner	ork, Limitations and imp	ergy consumption, Mining pc	
Module 3	Ethereum	Create a smart contract using solidity language	Components of Ethereum Ecosystem	No. of Classes:10
	•	•	n – Ethereum Programming La	0 0
Module 4	Blockchains in Business	Case Study	Conduct a case study or how BaaS is adopted in industries.	No. of
Topics: Blockch		kchain in Manufacturing re- Blockchain in Financ	: - Blockchain in Automobiles ial Industry	-Blockchain
			-	TIME

List of Laboratory	Tasks: NA
Targeted Applicati	on & Tools that can be used:
• Etherum F	Remix online & Ganache
 Solidity pr 	ogramming language
Project work/Assig	nment:
1. Calculate the	'number of ethers' for the transaction of gas limit for the scenario in which the sender
sets the gas li	mit to 50,000 and a gas price to 20 gwei.
-	e Ethereum Merkley Tree for the given list of Transactions.
-	y report of various types of Blockchain and its real time use cases.
decentralized	ichard Horrocks, Xun (Brian) Wu, "Blockchain By Example: A developer's guide to creating I applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited, 2018.
	"Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart lained", 2nd Edition, Packt Publishing Ltd, March 2018.
	ttps://www.udemy.com/course/build-your-blockchain-az/
	ine course : <u>https://nptel.ac.in/courses/106/104/106104220/#</u>
Textbook(s):	
	ichard Horrocks, Xun (Brian) Wu, "Blockchain By Example: A developer's guide to creating I applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited, 2018.
https://www.google	.co.in/books/edition/Blockchain By Example/ci59DwAAQBAJ?hl=en&gbpv=1
Catalogue prepared by	Ms Anitha Premkumar ,Dr.Senthilkumar
Recommended by the Board of Studies on	BOS NO: 16 th. BOS held on 25/07/22
Date of Approval	Academic Council Meeting No. 8, Dated 03/08/22
by the Academic	
Council	

Course Code: PG COURSE: CSE 2024	Course Title: NoSQL Databases Type of Course: Program Core Theory and Laboratory Integrated	L-P-C	2	2	3
Version No.	1.0		Jon	SENCTO	NACE I
Course Pre-	CSE2074-DBMS	R	EGISTRAR	Registi	rarst
requisites				* BANGAL	set /
Anti-requisites	NIL		1	0	

Description	and Object-Oriented databa architecture patterns will be	ase models. Advanta discussed. Hands-on e be provided. The rapid	s, such as Key-Value, Document, Co ges and disadvantages of the d xperience with a representative sar and efficient processing of data set ed.	ifferent data nple of open-	
Course Objectives	This course is designed to improve the learners' employability skills by using problem solving methodologies.				
Course Out Comes	[Knowledge] 2. Comprehend different type	damentals, characteris	s shall be able to: stics, and main benefits of NoSC through case studies. [Comprehensi ontent, and try queries on them. [Con	ion]	
Course Content:					
Module 1	NoSQL Database Architectures	Assignment	Knowledge	No. of Classes:6	
		ci, ney-value Data MO	del, Columnar Data Model, Graph D		
Module 2	Document data model	Assignment	Analysis	No. of Classes: 6	
Topics: Characteri		Collection, Naming, C	RUD Operation, Querying, Indexing	Classes: 6	
Topics: Characteri	stics of Document Data Model,	Collection, Naming, C	RUD Operation, Querying, Indexing	Classes: 6	
Topics: Characteri Sharding, Consiste Module 3 Topics: Install, Per	stics of Document Data Model, ncy, Update Consistency, Read C Document Data Model Hands on: Mongo DB / Casandra	Collection, Naming, C consistency, Relaxing Co Assignment	RUD Operation, Querying, Indexing onsistency, Capped Collection. Programming (Embedded	Classes: 6 g, Replication, No. of Classes:7	
Topics: Characteri Sharding, Consiste Module 3 Topics: Install, Per	stics of Document Data Model, ncy, Update Consistency, Read C Document Data Model Hands on: Mongo DB / Casandra	Collection, Naming, C consistency, Relaxing Co Assignment	RUD Operation, Querying, Indexing onsistency, Capped Collection. Programming (Embedded Lab)	Classes: 6 g, Replication, No. of Classes:7	
Topics: Characteri Sharding, Consiste Module 3 Topics: Install, Per Indexes, Security, I Module 4 Topics: Columnar Data M Vector-Wise, Colur Graph Data Mode algorithm- Web at	stics of Document Data Model, ncy, Update Consistency, Read C Document Data Model Hands on: Mongo DB / Casandra rform CRUD (create, read, upda Replication and Sharding. Basics of Columnar and Graph Data Models Iodel: Comparison of columnar mn-store internals and, Inserts/u I: Comparison of Relational and	Collection, Naming, C Consistency, Relaxing Co Assignment ate and delete) Opera Assignment Assignment r and row-oriented str pdates/deletes, Indexin Graph Modeling, Prop hain, page rank comp	RUD Operation, Querying, Indexing onsistency, Capped Collection. Programming (Embedded Lab) tions, Aggregations, Data Models, Comprehend orage, Column-store Architectures ng, Adaptive Indexing and Database perty Graph Model Graph Analytics utation, Topic specific page rank (Classes: 6 , Replication, No. of Classes:7 Transactions, No. of Classes: 7 : C-Store and Cracking. : Link analysis	

Lab Experiments are to be conducted on the following topics

Topic 1: Install MongoDB

Topic 2: Do lab experiment to perform CRUD (create, read, update and delete).

Topic 2: Demonstrate Aggregations in NoSQL with a real-life application.

Topic 3: Demonstrate different aspect of transactions in NoSQL by taking suitable problem.

Topic 5: Show making indexes in NoSQL with a suitable application.

Topic 6: Illustrate security features of NoSQL with a suitable problem.

Topic 6: Explain Sharding concept practically through a suitable example.

Targeted Applications (few are as given below):

1.Content Management systems are pretty common. All the comments on posts on social media are contained in a separate database. In MongoDB, a model has been designed to store such comments and is known as "MetaData and Asset Management".

2.MongoDB is widely used for storing product information and details by finance and e-commerce companies. You can even store the product catalogue of your brand in it.

3. MongoDB can also be used to store and model machine-generated data. For this, you can learn the "Storing Log data" document. This is known as operational intelligence.

List of MongoDB Tools

- MongoDB Compass.
- Mongo Management Studio.
- MongoJS Query Analyzer.
- Nucleon Database Master.
- NoSQLBooster.
- Studio 3T.
- MongoDB Spark Connector.
- MongoDB Charts.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Project Works:

 Create a database that stores road cars. Cars have a manufacturer, a type. Each car has a maximum performance and a maximum torque value. Do the following: Test Cassandras replication schema and Consistency models.
 Shopping Mall case study using cassendra, where we have many customers ordering items from the mal land we have suppliers who deliver them their ordered items.

Text Books

 Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition, 2019
 https://bigdata.in.gov/up.gov/uplaceda/2017/04/NaSQL Distilled.pdf

https://bigdata-ir.com/wp-content/uploads/2017/04/NoSQL-Distilled.pdf

2. Bradshaw & Chodorow. *MongoDB: The Definitive Guide: Powerful and Scalable Data Storage*, 3rd ed., O'Reilly, 2019

https://www.oreilly.com/library/view/mongodb-the-definitive/9781491954454/

References

- 1. Pivert. *NoSQL Data Models: Trends and Challenges*, 1st ed. Wiley, 2018 https://www.perlego.com/book/995563/nosql-data-models-trends-and-challenges-pdf
- Amit Phaltankar, Juned Ahsan, Michael Harrison, Liviu Nedov, MongoDB Fundamentals A hands-on guide to using MongoDB and Atlas in the real world: 1st edition, Packt publications, 2020 <u>https://www.perlego.com/book/2059687/mongodb-fundamentals-a-handson-guide-to-using-mongodb-and-atlas-in-the-real-world-pdf</u>

More than 25% of changes are made from the earlier version. Changes are highlighted in bold.

Topics relevant to development of "Employability": Better understanding of handling Un-structured data.

Topics relevant to "PROFESSIONAL ETHICS": Usage of un-structured data in more ethical manner.

Catalogue prepared by	Dr. Naga Raju Mysore, Dr.Senthilkumar
Recommended by the Board of Studies on	BOS NO: 16 th. BOS held on 25/07/22
Date of Approval by the Academic Council	Academic Council Meeting No. 8, Dated 03/08/22

Course Code: CSE3034	Course Title: BIG DATA SECURITY AND PRIVACY Type of Course: Elective in Big Data Basket Theory	L- P- C	3	0	3	
Version No.	1.0					
Course Pre- requisites	CSE219 Big Data Analytics					
Anti-requisites	NIL					
Course Description	The purpose of this course is to sensitize security in Big Data environments. This course will discover cryptographic principles, mechanisms to manage access controls in Big Data system. This course teaches the principles and practices of big data for improving the privacy and the security of computing systems. Big data is being applied in areas where there is great commercial advantage to be had, and consequently, attacks and failures have become a serious concern. It delves into a set of techniques for defending big data techniques against breaching of big data (the privacy aspect) and against malicious attacks (the security aspect).					
Course Objective	This course is designed to develop learners Employability Skills by le for Hadoop ecosystem components – Pig, Hive, Oozie, Flume.	earning Kerke	30 R. G R	A BUT	Gation"	

Course	On successful completion of this course the students shall be able to:			
Outcomes	i. Define cryptographic principles and mechanisms to manage access controls in Big Data system.[Knowledge]			
	ii. Explain security risks and challenges for Big Data system.[Knowledge]			
	iii. Recognize all security related issues in big data systems .[Comprehension]iv. Apply Kerberos configuration for Hadoop ecosystem components.[Application]			
			oop ecosystem components.[/	Application
Course Content:				
Module 1	Big Data Privacy, Ethics And Security	Assignment/Qui z	Big data security- organizational security	08 classes
Ownership – Ethica	ification of Anonymous Peo al Guidelines – Big Data Secu ata security-organizational se	urity – Organization	ata Privacy is self regulating al Security.	? – Ethics –
Module 2	Security, Compliance, Auditing, And Protection	Assignment	communication protocols for each of the Hadoop ecosystem components	08 classes
Challenge – Resear	ig data — Classifying Data Tch Questions in Cloud Secur nunication protocols for eacl	rity – Open Problem		ual Property
Module 3	Hadoop Security Design, Hadoop Ecosystem Security	Case study	Kerberos configuration for ecosystem tools	08 classes
Configuration. Con Sqoop.	-	op ecosystem compo	peros Security Implementation onents – Pig, Hive, Oozie, Flum	
Module 4	Data Security & Event Logging	Case study	Event monitoring in Hadoop cluster	08 classes
Setting up audit log	·		Sensitive Data in Hadoop – SII	EM system –
Assignment:				
a group of students.		ry resources and writ	an article topic will be given to ar te a report on their understandi 	
2. Presentation: Gr explain/demonstra	roup presentation, where th Ite the working and discuss t	e students will be g the applications for	iven a topic. They will have the same.	In In
			ĺ	WGRLOV

Text Bo					
		arayanan, "Securing Hadoop", Packt Publishing, 2013.			
2.	Ben Spivey	v, Joey Echeverria, "Hadoop Security Protecting Your Big Data Problem", O'Reilly Media,			
	2015.				
Referen	ce(s):				
Referen	ce Book(s):				
		n Rijmenam, "Think Bigger: Developing a Successful Big Data Strategy for Your Business",			
		edition, 2014.			
		hlhorst John Wiley & Sons, "Big Data Analytics: Turning Big Data into Big Money", John			
	Wiley & So				
	3. Sherif S	akr, "Large Scale and Big Data: Processing and Management", CRC Press, 2014.			
Online	Resources (e	e-books, notes, ppts, video lectures etc.):			
1.	Top Tips fo	or Securing Big Data Environments:			
	e-book	(http://www.ibmbigdatahub.com/whitepaper/top-tips-securing-big-data-environments-			
	ebook)				
2.	http://ww	w.dataguise.com/?q=securing-hadoop-discovering-and-securing-sensitive-datahadoop-			
	data-store	S			
3.	Gazzang f	for Hadoop			
	http://www	<u>w.cloudera.com/content/</u> cloudera/en/solutions/enterprisesolutions/security-for-			
	hadoop.ht	ml			
4.	eCryptfs fo	r Hadoop https://launchpad.net/ecryptfs.			
5.	Project Rh	ino - https://github.com/intel-hadoop/project-rhino .			
Weblink	<s:< td=""><td></td></s:<>				
		.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehos			
t-live&ebv=EB&ppid=pp_xiii					
https://	buniversity.ir	formaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live			
	p p				
Topics	related to d	evelopment of "FOUNDATION": Steps to secure big data ,Classifying Data.			
Topics	related to d	evelopment of "EMPLOYABILITY": Configuring Kerberos for Hadoop ecosystem			
-		Hive, Oozie, Flume			
compo	nents rig,				
Catalog	ue	Ms Pavithra.N , Dr.Senthilkumar			
prepare	ed by				
<u> </u>	nended by	BOS NO: 16 th. BOS held on 25/07/22			
the Boa					
Studies	on				
Date of	Approval	Academic Council Meeting No. 8, Dated 03/08/22			
	Academic	······································			
Council					

		annie Buch And
Course Code:	Course Title:	REGISTRAR Pregistrar
CSE2022	Domain Specific Predictive Analytics	L- P- C 3 0 MGA3
	Type of Course: Program Core and Theory only	

Version No.	1.0			
Course Pre- requisites	Fundamentals of Data Analytics			
Anti-requisites	NIL			
Course Description	The objective of the course is to emphasize that performing prediction on every domain belonging to industry/firm is measured as effective management. The student would learn that prediction helps the firms to effectively manage human power and other resources, which leads to good productivity. After successful completion of the course the student will understand application of predictive analytics. Few applications are as follows: customer churn management in the telecommunication sector, evaluation of customer lifetime value used in retail industry, sentiment analysis on product reviews to understand the customers opinion, news analytics, and social media analytics.			
Course Objective	The objective of the course is to introduce theoretical foundations, algorithms, methodologies for analysing data in various domains such as Retail, Finance, Risk and Healthcare.			
Course Outcomes	 On successful completion of the course the students shall be able to: Recognize challenges in dealing with data sets in domains such as finance, risk and healthcare. Identify real-world applications of machine learning in domains such as finance, risk and healthcare. Identify and apply appropriate algorithms for analyzing the data for variety of problems in finance, risk and healthcare. 			
Course Content:				
Module 1	Retail Analytics	Assignment	Programming/Data analysis task	8 Sessions

Understanding Customer: Profiling and Segmentation, Modelling Churn. Modelling

Lifetime Value, Modelling Risk, Market Basket Analysis.

Assignment: Determine which product is very likely to be purchased out of given set of products using Market basket analysis technique.

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Module 2	Risk Analytics	Assignment	Programming/Data analysis task	8 Sessions
Topics:				
Risk Managemen	t and Operational Hee	lging: An Overview,	Supply Chain Risk	
Management, A I	Bayesian Framework	for Supply Chain Ris	sk Management, Cred	it Scoring
and Bankruptcy H	Prediction.			
Assignment: To	apply appropriate	Machine learning	algorithms to under	stand Bankruptcy
Prediction.		5	C	1 5
	Financial Data			
Module 3	Analytics	Assignment	Data analysis	10 Sessions
Financial News	analytics: Framewor	k, techniques, and	metrics, News even	nts impact market
sentiment, Relatin	ng news analytics to st	ock returns, Financia	al Time Series and Th	eir Characteristics,
Common Financi	al Time Series models	S.		
Assignment. To	under various Markov	v chain models		
Module 4	Healthcare Data	Assignment	Data analysis	10 Sessions
	Analytics			
Introduction to H	ealthcare Data Analyt	ics, Electronic Healt	h Records, Privacy-P	reserving
Data Publishing N	Methods in Healthcare	, Clinical Decision S	upport Systems, Socia	al Media Analytics
for Healthcare: T	racking of Infectious	Disease Outbreaks, F	Readmission risk Pred	liction.
Natural Languag	ge Processing and D	Data Mining for Cl	inical Text: Core N	NLP Components,
Information, Ext	raction and Named E	Intity Recognition, S	Social Media Analyti	cs for Healthcare:
Tracking of Infec	tious Disease Outbrea	ks, Readmission risk	x Prediction.	
U	on & Tools that can be	-		
	nalytical Applications			
	lia Data Analysis			
Predictive Tools: Hadoon Frame	Analytics ework tools like map red	usa Hiya Hhasa Scoon	Spork	
Project work/Assig		uce, mve, mbase, scoop,		
Quiz/ Seminars/As	-			0
Text Book				anne encrum
	ata Mining Cookbook: N	Iodeling Data for Marl	keting, Risk, and Custor	ner Relationship REGISTRAR
Management", Wi Chandan K. Reddy,	iey, 2016. . Charu C. Aggarwal "He	althcare Data Analvtic	s", CRC Press, 2015.	A ANGIN OF
References		/	. ,	1 CIDALO

Rene Carmona "Statistical Analysis of Financial Data in R", Springer, 2014. Chris Chapman, Elea McDonnell Feit "R for Marketing Research and Analytics", Springer, 2015				
Catalogue prepared by Mr. Raghavendra M Devadas, Dr.Senthilkumar				
Recommended by the Board of Studies on	(BOS NO: SOCSE1st. BOS held on 22 / 12 / 2022)			
Date of Approval by the Academic Council (Academic Council Meeting No.20.3, Dated 15 /02 /23)				

Course Code: CSE3031	Course Title: Web Intellige Type of Course: Integrated	-	ics	L- P- C	2	2	3	
Version No.	1	1						
Course Pre- requisites	CSE2021- Data Mining							
Anti-requisites								
Course Description	This course is an introduction to Web Analytics and Web Intelligence - is not intended to provide an in-depth review of marketing principles and concepts. Nor is it intended to provide an in depth explanation or review of statistical analysis principles, though some of these principals and concepts will be mentioned from time to time in the lectures and reading materials. Rather, this course will give you the mastery of analytics to a sufficient degree to deploy Web Analytics platforms within your organizations and gain meaningful insights from them that can drive the bottom line.							
Course Objective	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.							
Course Out Comes	 On successful completion of the course the students shall be able to: A grounded understanding of web intelligence and business analytics terminology related to the above. How to deploy web intelligence to improve the outcomes of your marketing or business plan. How Analysts impact the bottom line (their role) within various businesses and lines of business Growth potentials for Web Analysts and Big Data professionals 							
Course Content:					0			
Module 1	INTRODUCTION TO INTELLIGENT WEB	Assignment	Data Collecti	•	Z		Sessions	
	INTELLIGENT WEB -Inside the s ent applications - Machine learr	-	-	-		1+1	/+ /	

	LISTEN AND LOAD	Case studies / Case let	Case studies / Case let	6 Sessions
LISTEN AI			atistics of Text - Analyzing Sen g data Technology and Trends.	timent and Intent –
Module 3	CLUSTERING AND CLASSIFICATION	Quiz	Case studies / Case let	9 Sessions
need for classificat		on of emails and span	nms - Clustering issues in very filtering - Classification with v	-
Module-5 PREDICT Sequence Memory and processed new List of Laboratory T using various tool and technologies i	The Semantic Web - Limits FING (6 hours) Statistical For - Network Science – Data A s stories. Tasks: Laboratory Work: to s and technologies to do th	of Logic - Description recasting - Neural Ne nalysis: Regression an analyzing the web fo e experimentation. In	nits, Dealing with Uncertainty and Resolution - Collective Re- tworks - Predictive Analytics - d Feature Selection - Case Stu or various functionalities give also involves installation an	asoning. Sparse Memories - dy - set of retrieved n in the subject and
	Pr	oject work/Assignn	nent:	
Assignment:				
2. Haralambos			and Big Data", Oxford Universit telligent Web", Manning public	
1. Gautam Sh 2. Haralambos References 1. Christopher D. Cambridge Univers 2. Mark Gardener, "E 5. W. N. Venables, D	Marmanis, Dmitry Babenko, Manning, Prabhakar Raghava ity Press, 2019. Beginning R - The Statistical P	"Algorithms of the In an, Hinrich Schütze, ", Pr ogramming Languag am, "An Introduction	telligent Web", Manning public An Introduction to Information ge", John Wiley & Sons, Inc., 20 to R", 2013. R3 Web resource	cations, 2019. Retrieval", 12.
 Gautam Sh Haralambos References Christopher D. Cambridge Univers Mark Gardener, "E W. N. Venables, D (/www.coursetalk Topics relevant to a 	Marmanis, Dmitry Babenko, Manning, Prabhakar Raghava ity Press, 2019. Beginning R - The Statistical P . M. Smith and the R Core Te com/coursera/web-intellige development of "Skill Develo	"Algorithms of the In an, Hinrich Schütze, ", Pr ogramming Languag am, "An Introduction ence-and-big-data Cou opment":	telligent Web", Manning public An Introduction to Information ge", John Wiley & Sons, Inc., 20 to R", 2013. R3 Web resource rse code Course Title L T	cations, 2019. Retrieval", 12.
1. Gautam Sh 2. Haralambos References 1. Christopher D. Cambridge Univers 2. Mark Gardener, "E 3. W. N. Venables, D p://www.coursetalk Topics relevant to Catalogue	Marmanis, Dmitry Babenko, Manning, Prabhakar Raghava ity Press, 2019. Beginning R - The Statistical F . M. Smith and the R Core Te .com/coursera/web-intellige	"Algorithms of the In an, Hinrich Schütze, ", Pr ogramming Languag am, "An Introduction ence-and-big-data Cou opment":	telligent Web", Manning public An Introduction to Information ge", John Wiley & Sons, Inc., 20 to R", 2013. R3 Web resource rse code Course Title L T	cations, 2019. Retrieval", 12.
1. Gautam Sh 2. Haralambos References 1. Christopher D. Cambridge Univers 2. Mark Gardener, "E 3. W. N. Venables, D p://www.coursetalk Topics relevant to Topics relevant to	Marmanis, Dmitry Babenko, Manning, Prabhakar Raghava ity Press, 2019. Beginning R - The Statistical P . M. Smith and the R Core Te .com/coursera/web-intellige development of "Skill Development of "Enviro	"Algorithms of the In an, Hinrich Schütze, ", Pr ogramming Languag am, "An Introduction ence-and-big-data Cou opment":	telligent Web", Manning public An Introduction to Information ge", John Wiley & Sons, Inc., 20 to R", 2013. R3 Web resource rse code Course Title L T ability	cations, 2019. Retrieval", 12.

Course Code: CSE3032	Course Title: Streaming Data Analyt Type of Course: Progr Theory and Lab Integr	am Core		L- P- C	2	2	3
Version No.	1.0						
Course Pre- requisites	CSE3002 - Big Data	Analytics					
Anti-requisites	NIL						
Course Description	The purpose of the course is to introduce theoretical foundations, algorithms, methodologies, and applications of streaming data. It also provides practical knowledge for handling and analyzing streaming data. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills. With good knowledge of the fundamentals of streaming analytics, the student can gain practical experience in implementing them, enabling the student to be an effective solution provider for applications that involve huge volume of streaming data.						
Course Objectives	This course is designe PROBLEM SOLVING I	ed to improve the lear		ABILITY	SKIL	LS by	/ using
Course Outcomes	real-world prIdentify and for a variety	ne characteristics of c roblems. apply appropriate a	lata streams t lgorithms for	hat make analyzin	e it use g the d	lata si	
Course Content:							
Module 1	Introduction to Data Streams	Programming Assignment	Streaming n	nethods		8 Cl	asses
Introduc	tion to Data Stream	s: Data Stream Mo	dels, Researc	h Issues	in Da	ata Si	treams
Managen	nent Systems, Knowled	lge Discovery from I	Data Streams,	Basic St	reamin	ıg Me	thods:
Counting	the Number of Occur	rence of the Elemen	ts in a Stream	, Counti	ng the	Num	ber of
Distinct	Values in a Stream, E	Bounds of Random	Variables, Po	oisson P	rocesse	es, S	Sliding
Windows	5.				9	REGIST	RAR REGIS

Module 2	Decision Trees and Clustering from	Programming Assignment	Streaming Data Collection and Analysis	10 Classes
Decision Trees	Data Streams		5	Desigion Trees
	8		oduction, The Very Fast D	
_			Continuous Attributes, Fu	
Leaves, Clusterin	ng Examples: Partitio	ning Clustering, Hie	erarchical Clustering, Micr	o Clustering,
Grid Clustering.				
			1	
Module 3	Frequent Pattern Mining	Programming Assignment	Streaming Data analysis	8 Classes
Frequent Patter	U		set Mining: The FP-growt	h Algorithm,
Summarizing Iter	msets, Heavy Hitter	s, Mining Frequent I	temsets from Data Streams	s: Landmark
_	-		emsets at Multiple Time (
Sequence Pattern	0		r	,
Sequence i uttern				
Module4			7 .	lasses
_		_	Jation Experiments, Evaluation	
_			Assessment, The 0-1 loss funct	ion, Evaluation
wiethodology in Nor	n-Stationary Environments	, The Page-Hinkley Algor	iunni	
.				
List of Laborato	ory Tasks: oring stream processin	g engine STORM		
-	loring stream processi			
2 Implementatio	n of decision tree alos	withma		
-	n of decision tree algo ementation of VFDT of		m	
1	ementation of CVFDT	•		
3 Implementatio	n of partitioning cluste	ering on stream		
-	ementation of partition	•	Leader Algorithm.	0
-	-		oning Clustering Algorithm	anne
4 Implementatio	on of micro clustering	on stream		REGISTRAR
-	ementation of Fractal		n Initialization phase	a togat
-	lementation of Fracta		-	1

5. Level 1: Implementation of The ODAC Global Algorithm.Level 2: Implementation of The ODAC: The Test Split Algorithm

6. Level 1 Implementation of the Apriori algorithm to find frequent itemsets Level 2: Implementation of the Apriori algorithm to find association rules

7. Level 1: Frequent Itemsets mining of data streams using LossyCounting algorithm Level 2: Reservoir Sampling for Sequential Pattern Mining over Data Streams.

Targeted Application & Tools that can be used:

- Apache Spark
- Social media Data Analysis

•

• Predictive Analytics

Project work/Assignment:

Students will be asked to develop a mini-project for streaming Data Analysis on streaming data.

Text Book

Joao Gama, "Knowledge Discovery from Data Streams", CRC Press, 2018.

References

David Luckham, "The Power of Events: An Introduction to Complex Event Processing in Distributed Enterprise Systems", Addison Wesley, 2016.

Charu C. Aggarwal, "Data Streams: Models And Algorithms", Kluwer Academic Publishers, 2017.

Weblinks:

http://www.liaad.up.pt/area/jgama/DataStreamsCRC.pdf

Topics relevant to development of "Employability": Streaming data analysis of twitter data using Apache Spark. Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS"": Naming and coding convention for Project Development.

Catalogue prepared by	Ms. Ila Chandrakar, Dr.Senthilkumar	
Recommended by the Board of Studies on	(BOS NO: SOCSE1st. BOS held on 22 / 12 / 2022)	
Date of Approval by the Academic Council	(Academic Council Meeting No.20.3, Dated 15/02/23)	0
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				15	(TD)
Course Code: CSE3150	Course Title: Front-end Full Stack Development	L- P- C	2	2	Registrar)

Version No.	1.0				
Course Pre-	Nil				
requisites					
Anti-requisites	NIL				
Course Description	This intermediate course enables students to perform front-end full stack development, with emphasis on employability skills. The course covers key technologies and architectures that enables the student to design and implement front-end. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.				
Course Objectives	This course is des PROBLEM SOLVI		e learners' EMPLOYABILITY SKI	LLS by using	
Course Outcomes	 On successful completion of the course the students shall be able to: 1) Describe the fundamentals of DevOps and Front-end full stack development. [Comprehension] 2] Illustrate development of a responsive web. [Application] 3] Apply concepts of Angular.js to develop a web front-end. [Application] 4] Apply concepts of Angular.js to develop a web front-end. [Application] 				
Course Content:					
Module 1	Fundamentals of DevOps and Web Development	Project	Programming	04 Sessions	
Lifecycle, Workflow & I	Principles; DevOps To ontrol. HTML5 – Synt ts, Text, Transform	ols Overview – Jenkins ax, Attributes, Events, '	Web Forms 2.0, Web Storage, Canvas		
Module 2	Responsive web design	Project	Programming	03 Sessions	
Introduction	ive Web Design; Java		TML DOM, objects, classes, Async; A crack of entry-exit information of a ho		
Module 3	Fundamentals of Angular.js	Project	Programming	08 Sessions	
concepts with TypeSc applications; Compone Angular Routing; Obse Requests; Authentication Deploying an Angular	ript; Angular Funda ents & Databinding ervables; Handling F on & Route Protectio	mentals; Angular CLl in Depth; Angular Di orms in Angular Appo n; Dynamic Compone	M; Introduction to TypeScript; Worl ; Introduction to TypeScript; Debu rectives; Using Services & Depend s; Output transformation using Pipes nts; Angular Modules & Optimizing Capabilities with Service Workers;	gging Angular they bajection; ; Making Http Angular Apps;	

Module 4	Fundamentals of React.js	Project	Programming	15 Sessions
Salvation; Two Distin NPM; JSX Walkthroug	; Reactive Programn ct Ways of Initializir gh; React Testing.	ng a React Class	ponents; Render Method; Virtu States & Life Cycles; Compon	
<u> </u>	**		es/events (like bookmyshow).	
Targeted Applicatio	n & Tools that can	be usea:		
Application Area is t by all application de Professionally Used	evelopers.		ncy of Algorithms. This fund	amental course is used
			plementation of programs. rio using Java.	
•		0	5	
Text Book:	"Front-end Fundame	ntals" Loonnub	2015	
T2. Northwood, Ch		eveloper: Your E	ssential Guide to the Everyday Sk	kills Expected of a Modern
References:				
. .	rav Gupta, and Asoj T		dition. 7th ed. O'Reilly Media; 20 ive Web Design with HTML5 and	
R3. Duckett J Rupp R4. Greg Sidelnikov R5. Web Reference	ert G Moore J. <i>"Javas</i> 1, <i>"React.js Book_ Lea</i> 1:	rning React Java	nteractive Front-End Web Develo Script Library", 1 edition, Scratch	-River Tigris LLC 2016
			klist=PLd3UqWTnYXOkTSBCBNyy	/hxo_jxlY_uTWA&index=2
Catalogue prepared	Dr. Jayakumar V, D	or. IVI Chandrashe	khar, Dr. Murali Parameswaran	
by Recommended by the Board of Studies on	(BOS NO: SOCSE1	BOS held on 2	2 / 12 / 2022)	
Date of Approval by the Academic	(Academic Counc	il Meeting No.2	0.3 , Dated 15 /02 /23)	

Course Code: CSE3151	Course Title: Java Full Stack Development	L- P- C	2	2	3
Version No.	1.0		0	amile	NCYUNI
Course Pre- requisites	Nil		REG	STRAR	Registrar
Anti-requisites	CSE3152 .NET Full Stack Development			10	MGALOS

Course Description	This advanced level course enables students to perform full stack development using Java, with emphasis on employability skills. The key technologies used for Full Stack development is based on either Java technology or .NET technology. In this course, the focus is on using Java, and the related technologies/tools like Java EE, Java Persistence, Hibernate, Maven, Spring Core, etc. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course. This course is designed to improve the learners' EMPLOYABILITY SKILLS by using						
Course Objectives		VING Methodologies.	leaners Elvir LOTABILITT SKILL	is by using			
Course Outcomes	On successful completion of the course the students shall be able to: 1] Practice the use of Java for full stack development [Application] 2] Show web applications using Java EE. [Application] 3] Solve simple applications using Java Persistence and Hibernate [Application] 4] Apply concepts of Spring to develop a Full Stack application. [Application] 5] Employ automation tools like Maven, Selenium for Full Stack development. [Application]						
Course Content:							
Module 1	Introduction	Project	Programming	03 Sessions			
Topics: Review of Java; Adva	anced concepts of	Java; Java generics; Java IO;	New Features of Java. Unit Testing too	ols.			
Module 2	Java EE Web Applications	Project	Programming	05 Sessions			
with JSP; JSP Star Session, Cookies; F Integrating JDBC w	ndard Tag Librai Request Redirect vith MVC App	ry - Core & Function Tag	g HTML form Data with JSP; State M ss; Servlet API Fundamentals; Serv MVC App with Servlets & JSP; Com	letContext,			
Module 3	Java Persistence using JPA and Hibernate	Project	Programming	06 Sessions			
Topics: Fundamentals of Java Persistence with Hibernate; JPA for Object/Relational Mapping, Querying, Caching, Performance and Concurrency; First & Second Level Caching, Batch Fetching, Optimistic Locking & Versioning; Entity Relationships, Inheritance Mapping & Polymorphic Queries; Querying database using JPQL and Criteria API (JPA) Assignment: Design and develop a website that can actively keep track of entry-exit information of a housing society							
Module 4	Spring Core						
Topics: Spring Core, Spring MVC, Spring Boot REST API; Understanding Spring Framework; Using Spring MVC, Building a Database Web App with Spring and Hibernate o Spring AOP (Aspect Oriented Programming); Implementing Spring Security; Developing Spring REST API; Using Spring Boot for Rapid Development Assignment: Develop a software tool to do inventory management in a warehouse.							

Module 5	Automation tools	Project	Programming	06 Sessions
pom.xml and Direc Functional/BDD Tes Configuration, Locat Assignment: Illustra	tory Structure, N ting using Seleniu ing WebElements, ate the use of autor	Aulti-Module Project Cre um, Selenium Fundament Driver Commands, WebE nation tools in the develop	mentals, Software Setup - Cor ation, Scopes, Dependency M als and IDE, Selenium WebD lement Commands ment of a small software proje	Management, Profiles; Driver, Installation and
used by all applica	s to Design and <i>i</i> ation developers	Analyzing the efficiency	of Algorithms. This fundan ate, Selenium, Maven, GIT.	nental course is
	olving: Design o	f Algorithms and imple ation of given scenario	mentation of programs. using Java.	
Text Book: T1. Fender, Your	ng, "Front-end Fun	damentals", Leanpub, 201	5	
References R1. Soni, Ravi Kar Using Angu	nt. "Full Stack Ang larJS with Spring R t. "Full Stack Javas	ularJS for Java Developers BESTful." , Apress, 2017.	: Build a Full-Featured Web Ap Node.js and MongoDB.", Apres	
Recommended by the Board of Studies on	(BOS NO: SOCS	E1. BOS held on 22 / 12	2 / 2022)	
Date of Approval by the Academic Council	(Academic Cou	ncil Meeting No.20.3 , D	Dated 15 /02 /23)	

Course Code: CSE3152	Course Title: .NET Full Stack Development	L- P- C	2	2	3
Version No.	1.0		•		•
Course Pre- requisites	Nil		0		
Anti-requisites	CSE3151 Java Full Stack Development		0	anne	NCYUNIL
			REG	STRAR	Registrar

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Course	This advanced level course enables students to perform full stack						
Description	development using .NET, with emphasis on employability skills. The key						
	technologies used for Full Stack development is based on either Java						
	technology or .NET technology. In this course, the focus is on using .NET						
	and the related technologies/tools like C#, ASP.NET, Entity Framework						
	Core, etc. On successful completion of this course, the student shall be able						
	· ·	1	·				
	to pursue a career in full-stack development. The students shall develop						
	strong problem-solving skills as part of this course. This course is designed to improve the learners' EMPLOYABILITY SKILLS by using						
Course			learners EMPLOYABILITY SKILL	S by using			
Objectives	PROBLEM SOLVING Methodologies.						
Course	On successful co	ompletion of the course the	students shall be able to:				
Outcomes	1] Practice the use of C# for developing a small application [Application]						
	2] Show web applications using Entity Framework. [Application]						
	-		L and ASP.NET [Application]				
	4] Apply concepts of ASP.NET to develop a Full Stack application. [Application]						
Course Content:							
	C#						
	-			10			
Module 1	Programming for Full Stack	Project	Programming	Sessions			
	Development			Sessions			
Tonica	Development						
Topics:	ndomontola View	al Studia IDE Eurodamantala	C# Language Features Working with	arrays and			
			, C# Language Features, Working with	-			
-		-	cision and iteration statements, Manag				
			cepts, Properties, Auto Implemented				
-			Sealed Classes/Methods, Partial Classe				
			rking with data collections including LIN	ю, папuling			
errors and exceptions, Working with Files, Unit Testing – Nunit framework Assignment: Develop a small application for managing library using C#.							
Assignment: Deve	1		y using C#.				
Mardula 2	Entity	Ducient	Due europein e	06			
Module 2	Framework	Project	Programming	Sessions			
Taulas	Core 2.0						
Topics:							
			n To Entity Framework and EDM; Q				
_			y Framework - DbContext [EF6];	Advanced			
•	•	ation; Data Access with AD					
Assignment: Deve	lop an applicatic	on for managing HR policie	s of a department.				
Madula 2		Project	Brogramming	06			
Module 3	ASP.NET		Programming	Sessions			
Topics:	•		0	<u>L</u>			
	P.Net Core 3.1 MV	/C, ASP.NET Core Middlew	are and Request pipeline, Review of SQ	Lusing MS			
SQL, Working With Data In Asp.Net, Razor View Engine, State Management In Asp. Net MVC & Lagarts,							
Assignment: Develop a web application to mark entry/exit of guests in a building.							
Modulo 4	ASP.NET	Project	Brogramming	08.0			
Module 4	ASP.INE I	Project	Programming	Sessions			

Topics:

Introduction To Models, Validations In Asp.Net MVC, Authentication and Authorization In Asp.Net MVC, Advanced Asp. Net MVC - Ajax Action Link In MVC, Advanced Asp.Net MVC - Ajax Forms In MVC, Microsoft Testing Framework – Unit Testing the .NET Application

Assignment: Develop a software tool to do inventory management in a warehouse.

Targeted Application & Tools that can be used:

Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.

Professionally Used Software: Visual Studio

Project work/Assignment:

- 1. Problem Solving: Design of Algorithms and implementation of programs.
- 2. Programming: Implementation of given scenario using .NET.

Text Book:

- T1. Fender, Young, "Front-end Fundamentals", Leanpub, 2015
- T2. Valerio De Sanctis, "ASP.NET Core 5 and Angular: Full-stack web development with .NET 5 and Angular 11", 4th Edition, Packt, 2021.

References

- R1. Benjamin Perkins, Jon D. Reid, "Beginning C# and .NET", Wiley, 2021 Reid, 2021.
- R2. Piotr Gankiewicz, "Full Stack .NET Web Development", Packt Publishing, 2017.
- R3. Tamir Dresher, Amir Zuker, Shay Friedman, *"Hands-On Full-Stack Web Development with ASP.NET Core"*, Packt Publishing, 2018.
- R4. Dustin Metzgar, "Exploring .NET core with microservices, ASP.NET core, and Entity Framework Core", Manning, 2017.

2017.		
Catalogue	Dr. Komalavalli C, Dr. Jayakumar V, Dr. Murali Parameswaran	
prepared by		
Recommended by	(BOS NO: SOCSE1. BOS held on 22 / 12 / 2022)	
the Board of		
Studies on		
Date of Approval	(Academic Council Meeting No.20.3 , Dated 15 /02 /23)	
by the Academic		
Council		

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