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PRESIDENCY UNIVERSITY

Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956
Approved by AICTE, New Delhi

School of Engineering

Bachelor of Technology Degree

Program Regulations and Curriculum 2020-2024

B. Tech. Computer Science and Technology (Big Data)

2020-2024

Regulations No: PU/AC-20.3/SOCSE01/CBD/2020-24
Resolution No. 3 of the 20th Meeting of the Academic Council held on 15th February 23, and Ratified by the Board of Management in its 21st Meeting held on 22nd February 2023

February-2023

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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);

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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.

1.5. These Program Regulations may evolve and get amended or modified or changed through appropriate approvals from the Academic Council, from time to time, and shall be binding on all concerned.

1.6. The effect of periodic amendments or changes in the Program Regulations, on the students 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.

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.

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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.

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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

S. No.	*B. Tech. Program (Branch/Discipline)*	*Parent Department*
1	B. Tech. (Civil Engineering)	Department of Civil Engineering
2	B. Tech. (Computer Engineering)	Department of Computer Science and Engineering
3	B. Tech. (Computer Science and Engineering)	
4	B. Tech. (Information Science and Engineering)	
5	B. Tech. (Information Science and Technology)	
6	B. Tech. (Computer Science and Technology)	
7	B. Tech. (Electronics and Computer 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)	
11	B. Tech. (Computer Science and Engineering-Block Chain)	

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Table 2.1 B. Tech. Degree Programs and Respective Parent Departments		
S. No.	***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 (Big Data)) 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 (Big Data) 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 non-refundable 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 studying 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,

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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 weeks in an Industry/Company, subject to the following conditions:

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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 2nd or 3rd Year of the B. Tech. Program. The nature and details of the SIC shall be approved by the

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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:

Table 2.11.1 Method of Assessment for 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

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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 conducted as an optional test to allow for improvement with approval of the Dean, School of Engineering. If a Test 3 is provided, then the higher marks obtained in any two tests shall be considered for evaluation.

(ii) Normally, the End Term Final Examination shall cover the entire course coverage as prescribed in the Course Handouts.

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.

Table 2.11.2 Method of Assessment for Practical Courses with Credit Structures 0–0–P and L–0–P

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	30%	NA

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	applicable, and as prescribed by the Course Handout.		
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.

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 Open Elective Courses and/or the mandatory credit requirements of Management Sciences Courses as prescribed in the concerned B. Tech. Program Regulations 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

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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 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 concerned student in the Semester immediately following the completion 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 2.13.2 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	O
2	From 80% to 89%	A+
3	From 70% to 79%	A
4	From 60% to 69%	B+
5	From 50% to 59%	B
6	From 40% to 49%	C

2.13.10. A student may submit a request for credit transfer from SWAYAM-NPTEL Courses before the last instruction day of the seventh (7^{th}) Semester of the B. Tech. program as specified in the Academic Calendar. Requests for credit transfers shall not be permissible in the eighth (8^{th}) 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 (BIG DATA))
2020-2024

B.Tech in Computer Science and Technology (Big Data) 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 (Big Data) at Presidency University are as follows.

Program Educational Objectives (PEO)

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

PEO1: Demonstrate as a Computer Engineering Professional

PEO 02: A Teaching and Research Professional in the area of Computer Science and Technology through lifelong learning.

PEO 03: A Freelancing consultant to the computer science and technology – Big Data Industry.

PEO 04: An entrepreneur in the computer and other related areas of specialization.

Program Outcomes (PO)

Graduates of the B. Tech. Program in Computer Science and Technology (Big Data) 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.

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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 (Big Data) the students shall:

PSO-1: [Problem Analysis]: Identify, formulate, research literature, and analyse complex engineering problems related to Software Engineering principles & practice, Programming, Big Data computing & analytics Substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PSO-2: [Design/development of Solutions]: Design solutions for complex engineering problems related to Software Engineering principles & practice, Programming, Big Data Computing & analytics 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.

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PSO-3: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities related to Software Engineering principles & practice, Programming, Big Data Computing & analytics 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 (Big Data)) 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

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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
The mandatory minimum Credits required for the award of the Degree is 182 Credits.			

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.

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 (Big Data)) Program.

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

First Year			Second Year			Third Year			Fourth Year	
Physics Cycle Sem. 1/2	**Chemistry Cycle Sem. 1/2**		**Sem.3**	**Sem 4**		**Sem 5**	**Sem 6**		**Sem 7**	**Sem 8**
BS-3 ES-4 HS-2 PPS-1	BS-4 ES-3 HS-1 PPS-1	Summer Term	MAT – BS-1 OE 1 PPS1 Core 4	Mat - BS 1 DE 1 Core – 5 PPS-1	Summer Term/PP-I	DE -1 MS-1 PP-1 Core-6	DE -2 MS-1 Core-5 SIC -1	Summer Term	DE-6 OE-1	PP-1

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

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 extent of approximately 30% out of the total credits of 182 for B.Tech (Computer Science and Technology (Big Data)) Program of four years duration.

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3.2 SUGGESTED PROGRAM STRUCTURE

I SEM - PHYSICS CYCLE (Aug-Dec)*									
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTACT HOURS	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	CREDITS			
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	P	Env[4]
5	MEC 152	Engineering Graphics	2	0	4	4	6	P	-
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	P	-
10	PPS 105	Building Self Confidence	0	0	2	0	2	E	-
		TOTAL	**18**	**2**	**8**	**24**	**30**		

[1] Foundation Course
[2] Professional Skills
[3] Employability Skills
[4] Environmental Issues

I SEM - CHEMISTRY CYCLE (Aug-Dec)#									
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTACT HOURS	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	CREDITS			
1	MAT 105	Calculus and Linear Algebra	3	1	0	4	4	F	-
2	CHE 101	Engineering Chemistry	4	0	0	4	4	F	-

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3	ECE 101	Elements of Electronics Engineering	3	0	0	3	3	P	-
4	MEC 101	Elements of Mechanical Engineering	3	0	0	3	3	P	-
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	E	-
7	CSE 151	Computer Programming	2	0	4	4	6	E	-
8	CHE 151	Engineering Chemistry Lab	0	0	2	1	2	F	-
9	PPS 105	Building Self Confidence	0	0	2	0	2	F	PE[5]/S[6]
		TOTAL	**19**	**1**	**8**	**24**	**30**		

[5] Professional Ethics
[6] Sustainability Issues

II SEM - CHEMISTRY CYCLE (Jan-May)#

S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTACT HOURS	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	CREDITS			
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	P	-
4	MEC 101	Elements of Mechanical Engineering	3	0	0	3	3	P	-
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	E	-
7	CSE 151	Computer Programming	2	0	4	4	6	E	-
8	CHE 151	Engineering Chemistry Lab	0	0	2	1	2	F	-
9	PPS 106	Effective Communication	0	0	2	0	2	E	-

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		TOTAL	**19**	**1**	**8**	**24**	**30**		

II SEM - PHYSICS CYCLE (Jan-May)*									
S. NO.	**COURSE CODE**	**COURSE NAME**	**CREDIT STRUCTURE**				**CONTACT HOURS**	**TYPE OF SKILL**	**COURSE ADDRESSES TO**
			L	**T**	**P**	**CREDITS**			
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	P	Env
5	MEC 152	Engineering Graphics	2	0	4	4	6	P	-
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	P	-
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 SEMESTER								
S.No.	**COURSE CODE**	**COURSE NAME**	**CREDIT STRUCTURE**				**CONTACT HOURS**	**TYPE OF SKILL**
			L	**T**	**P**	**C**		
1	MAT2001	Transform Techniques and Partial Differential Equations	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	E
7	CSE2008	Programming in Java	1	0	4	3	5	S
8	CSEXXXX	Discipline Elective – I	3	0	0	3	3	S/EM
		TOTAL	**19**	**0**	**8**	**22**	**27**	

IV SEMESTER								
S.No.	**COURSE CODE**	**COURSE NAME**	**CREDIT STRUCTURE**				**CONTACT HOURS**	**TYPE OF SKILL**
			L	**T**	**P**	**C**		
1	MAT2002	Numerical Methods, Probability and Sampling Techniques	3	0	0	3	3	F
2	CSE2007	Design and Analysis of Algorithms	2	0	2	3	4	S
3	ECE2002	Digital Electronics	3	0	2	4	5	S
4	CSE2010	Operating Systems	3	0	0	3	3	S
5	CSE2012	Database Management Systems	2	0	4	4	6	S
6	CSE2016	Discrete Mathematical Structures	3	0	0	3	3	S
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**	

V SEMESTER								
S.No.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTACT HOURS	TYPE OF SKILL
			L	T	P	C		
1	CSE2011	Data Communications and Computer Networks	2	0	2	3	4	S
2	CSE3002	Big Data Technologies	2	0	2	3	4	S
3	CSE2014	Software Engineering	3	0	0	3	3	S
4	CSE2018	Theory of Computation	3	0	0	3	3	S
5	MGT113/MGT112	Digital Entrepreneurship/ Engineering Economics	3	0	0	3	3	S/EM
6	CSE3001	Artificial Intelligence and Machine Learning	2	0	2	3	4	S
7	CSE2024	No SQL Databases	2	0	2	3	4	S
8	CSEXXXX	Discipline Elective – II	3	0	0	3	3	S/EM
9	PIP 101	Professional Practice - I	-	-	-	5	-	P/E
			20	0	8	29	28	

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VI SEMESTER								
S.No.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTACT HOURS	TYPE OF SKILL
			L	T	P	C		
1	CSE2013	Cloud Computing	3	0	0	3	3	EM
2	CSE2067	Web Technologies	2	0	**2**	3	4	S
3	CSE3031	Web Intelligence and Analytics	2	0	2	3	4	S
4	CSE3032	Streaming data Analytics	2	0	2	3	4	EM
5	CSE3034	Big data Security and Privacy	3	0	0	3	3	S
6	CSEXXXX	Discipline Elective – III	3	0	0	3	3	S/EM
7	MGT113/MGT112	Digital Entrepreneurship/ Engineering Economics	3	0	0	3	3	S/EM/EN
8	CSEXXXX	Discipline Elective – IV	3	0	0	3	3	S/EM
9	SIC 501	Social Immersion Course	-	-	-	0	-	P
		TOTAL	**21**	**0**	**6**	**24**	**27**	

VII SEMESTER								
Sl. No.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTACT HOURS	TYPE OF SKILL
			L	T	P	C		
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	XXXXXX	Open Elective – III	3	0	0	3	3	
5	PIP104	Professional Practice - II	-	-	-	10	-	
6	XXXXXX	Open Elective – IV	0	0	2	1	2	
7	XXXXXX	Open Elective – V	0	0	2	1	2	
8	XXXXXX	Open Elective – VI	0	0	6	3	6	

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		TOTAL	**12**	**0**	**10**	**27**	**22**	

VIII SEMESTER								
Sl. No.	**COURSE CODE**	**COURSE NAME**	**CREDIT STRUCTURE**				**CONTACT HOURS**	**TYPE OF SKILL**
			L	**T**	**P**	**C**		
1	CSEXXXX	Discipline Elective – VIII	3	0	0	3	3	S/EM
2	CSEXXXX	Discipline Elective – IX	3	0	0	3	3	S/EM
3	CSEXXXX	Discipline Elective – X	3	0	0	3	3	S/EM
		TOTAL	**9**	**0**	**0**	**9**	**9**	

Proposal for Continuation of PIP102 for Students who have gone abroad under various MOUs							
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**TYPE OF SKILL**
1.	PIP102	Professional Practice - II	-	-	-	15	

TABLE — 3.2.1								
LIST OF MANAGEMENT SCIENCES COURSES								
S.NO	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	**C**	**CONTACT HOURS**	**TYPE OF SKILL**
1	MGT113	Digital Entrepreneurship	3	0	**0**	3	3	S/EM/EN
2	MGT112	Engineering Economics	3	0	**0**	3	3	S

Table 3.2.2								
DISCIPLINE ELECTIVE								
S.NO	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	**C**	**CONTACT HOURS**	**TYPE OF SKILL**

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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	EM
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

Table 3.2.3								
OPEN ELECTIVES OFFERED								
S.NO	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	**C**	**CONTACT HOURS**	**TYPE OF SKILL**
1	ECE1004	Microprocessor based Systems	3		0	3	3	
2	CIV 1001	Disaster Management & Mitigation (DM&M)	3		0	3	3	
3	CIV 2002	Occupational Health & Safety (OH&S)	3		0	3	3	
4	CIV 2001	Sustainaibility Concepts in Engineering (SCE)	3		0	3	3	
5	CIV 2004	Integrated Project Management **(IPM)**	3		0	3	3	
6	CIV 383	Infrastructure Systems for Smart Cities (ISSC)	3		0	3	3	
7	PET 2025	Oil and Gas Quality Management (O&GQM)	3		0	3	3	
8	PET 2028	Petroleum Economics (PE)	3		0	3	3	
9	PET 2023	Petroleum Corrosion Technology (PCT)	3		0	3	3	
10	PET 2026	Health, Safety and Environment (HS&E)	3		0	3	3	

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11	EEE 1003	Basic Circuit Analysis using NI LAB view (BCA-NI LAB)	3		0	3	3	
12	EEE 1004	Automation and Control in Industries using PLC Programming **(A&CI-PLC)**	3		0	3	3	
13	CHE1011	Chemical and Petrochemical catalysts (C&PC)	3		0	3	3	
14	CHE1009	3D printing with polymer (3DPP)	3		0	3	3	
15	CHE1015	Waste to fuel **(WTF)**	3		0	3	3	
16	CHE1008	Energy and Sustainability (E&S)	3		0	3	3	
17	MEC1001	Fundamentals of Automobile Engineering (FAUE)	3		0	3	3	
18	MEC1002	Introduction to Matlab and Simulink (IM&S)	3		0	3	3	
19	MEC1003	Engineering Drawing (ED)	3		0	3	3	
20	MEC2001	Renewable Energy Systems (RES)	3		0	3	3	
21	MEC2002	Operations Research & Management (OR&M)	3		0	3	3	
22	MEC2003	Supply Chain Management (SCM)	3		0	3	3	
24	MEC2004	Six Sigma for Professionals (SSP)	3		0	3	3	
25	MEC2005	Fundamentals of Aerospace Engineering (FAE)	3		0	3	3	
26	MEC2006	Safety Engineering (SE)	3		0	3	3	
27	MEC2007	Additive Manufacturing (AM)	3		0	3	3	

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28	MEC3001	Electric Vehicles & Battery Technology (EV&BT)	3		0	3	3	
29	MEC3069	Engineering Optimisation (EO)	3		0	3	3	
30	MEC3070	Electronics Waste Management (EWM)	3		0	3	3	
31	MEC3071	Hybrid Electric Vehicle Design (HEVD)	3		0	3	3	
32	MEC3072	Thermal Management of Electronic Appliances (TMEA)	3		0	3	3	
33	CIV 280	Environmental Impact Assessment (EIA)	3		0	3	3	
34	CIV 2044	Geospatial Applications for Engineers **(GAE)**	3		0	3	3	
35	CIV 382	Systems Design for Environment and Sustainability **(SDES)**	3		0	3	3	
36	CIV 383	Infrastructure Systems for Smart Cities (ISSC)	3		0	3	3	
37	CIV 1001	Disaster Management & Mitigation **(DM&M)**	3		0	3	3	
38	CIV 2004	Integrated Project Management (IPM)	3		0	3	3	
39	CIV 2002	Occupational Health & Safety (OH&S)	3		0	3	3	
40	PET 406	Polymer Technology (PT)	3		0	3	3	
41	PET 408	Oil and Gas Transportation and Marketing (O&GT&M)	3		0	3	3	
42	PET 409	Material Science and Engineering (MS&E)	3		0	3	3	
43	EEE 221	Energy Audit (EA)	3		0	3	3	
44	EEE 223	Smart Grid Technology (SGT)	3		0	3	3	

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45	MEC 102	Automotive Vehicles (AV)	3		0	3	3	
46	MEC 103	Nanotechnology (NT)	3		0	3	3	
47	MEC 328	Engineering Optimisation (EO)	3		0	3	3	
48	MEC 329	Operations Research for Engineers (ORE)	3		0	3	3	
49	MEC 104	Operations Management (OM)	3		0	3	3	
50	MEC 105	Work Study **(WS)**	3		0	3	3	
51	MEC 106	Project Management (PM)	3		0	3	3	
52	MEC 107	Organizational Behaviour (OB)	3		0	3	3	
53	MEC 330	Renewable Energy Systems (RES)	3		0	3	3	
54	MEC 331	Design of Automatic Control Systems (DACS)	3		0	3	3	
55	ECE295	Artificial Neural Networks (ANN)	3		0	3	3	
56	ECE 297	IOT: Internet of Things (IOT)	3		0	3	3	
57	ECE 299	Computational Intelligence and Machine Learning (CI&ML)	3		0	3	3	
58	ENG1012	Gender and Society in India - (G&S)	3		0	3	3	
59	ENG1008	Indian Literature - (IL)	3		0	3	3	
60	ENG1013	Indian English Drama - (IED)	3		0	3	3	
61	CIV1001	Disaster mitigation and management - (DM&M)	3		0	3	3	
62	CIV1002	Environment Science and Disaster Management - (ESDM)	3		0	3	3	

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63	CIV2001	Sustainability Concepts in Engineering - (SCE)	3		0	3	3	
64	CIV2002	Occupational Health and Safety - (OH&S)	3		0	3	3	
65	CIV2003	Sustainable Materials and Green Buildings - (SM&GB)	3		0	3	3	
66	CIV2005	Environmental Impact Assessment - (EIA)	3		0	3	3	
67	EEE1006	Smart Sensors for Engineering Applications - (SSEA)	3		0	3	3	
68	MEC 2005	Fundamentals of Aerospace Engineering - (FAE)	3		0	3	3	
69	MEC 1001	Fundamentals of Automobile Engineering - (FAUE)	3		0	3	3	
70	MEC 1003	Electronic Waste Management - (EWM)	3		0	3	3	
71	MEC 3070	Engineering Drawing - (ED)	3		0	3	3	
72	MEC 1005	Workshop Practice - (WSP)	3		0	3	3	
73	MEC2001	Renewable Energy Systems - (RES)	3		0	3	3	
74	CHE1013	Chemistry for engineers - (CFE)	3		0	3	3	
75	CHE1006	Introduction to Nano technology - (INT)	3		0	3	3	
76	CHE1004	Smart materials for IOT - (SMFI)	3		0	3	3	
77	CHE1014	Surface coatings technology and corrosion Science - (SCT&CS)	3		0	3	3	
78	CHE1010	Bioinformatics - (BI)	3		0	3	3	
79	CHE1008	Energy and sustainability - (E&S)	3		0	3	3	

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80	COM 2004	Introduction to Banking - (ItoB)	3		0	3	3	
81	COM 2001	Introduction to Human Resource Management - (IHRM)	3		0	3	3	
82	PET1006	Overview of Energy Industry - (OEI)	3		0	3	3	
83	PET1005	Geology for Engineers - (GFE)	3		0	3	3	
84	ECE1004	Microprocessor Based Systems - (MBS)	3		0	3	3	
85	ECE1005	Fundamentals of Communication Systems - (FCS)	3		0	3	3	
86	MBA1004	Essentials of Leadership - (EL)	3		0	3	3	
87	DES2001	Design Thinking - (DT)	3		0	3	3	
88	DES1121	Introduction to UX Design - (IUXD)	3		0	3	3	
89	DES1122	Introduction to Jewellery Making - (IJM)	3		0	3	3	
90	DES1123	Introduction to packaging Design - (IPD)	3		0	3	3	
91	DES1124	Spatial Stories - (SS)	3		0	3	3	
92	DES1125	Wonder clay - (WC)	3		0	3	3	

3.3 COURSE DESCRIPTION AND SYLLABUS

Course Name:	**Calculus and Linear Algebra**					
Course Code:	**MAT 105**	**Credit Structure :**	**L**	**T**	**P**	**C**
			3	**1**	**0**	**4**

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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

PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Name:	Engineering Physics					
Course Code:	PHY 101	Credit Structure :	L	T	P	C
			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.

Reference Books:

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

PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Name:	Elements of Electrical Engineering					
Course Code:	EEE 101	Credit Structure :	L	T	P	C
			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.

Reference Books:

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.

REGISTRAR

PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Name:	Elements of Civil Engineering					
Course Code:	CIV 101	Credit Structure :	L	T	P	C
			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.

Reference Books:

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

PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Name:	Engineering Graphics					
Course Code:	MEC 152	Credit Structure :	L	T	P	C
			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

Course Name:	Technical Written Communication					
Course Code:	ENG 103	Credit Structure :	L	T	P	C
			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.

Reference Books:

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

PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Name:	Engineering Physics Lab					
Course Code:	PHY 151	Credit Structure :	L	T	P	C
			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).

REGISTRAR

PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Name:	Workshop Practice					
Course Code:	MEC 151	Credit Structure :	L	T	P	C
			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.

REGISTRAR

PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Name:	Calculus, Differential Equations and Complex Variables					
Course Code:	MAT 106	Credit Structure :	L	T	P	C
			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.

Reference Books:

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.

REGISTRAR

PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Name:	Transform Techniques and Partial Differential Equations					
Course Code:	MAT 2001	Credit Structure :	L	T	P	C
			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.

Course Name:	Numerical Methods, Probability and Sampling Techniques					
Course Code:	MAT 2002	Credit Structure :	L	T	P	C
			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, chi-squared 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.

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Course Name:	Numerical Methods, Probability Distributions and Sampling Techniques					
Course Code:	CSE2002	Credit Structure :	L	T	P	C
			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, chi-squared test of goodness of fit.

Textbooks

4. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons (India), 2014.
5. 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.
6. 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

3. B.S. Grewal, "Higher Engineering Mathematics", 43rd edition, Khanna Publishers.
4. 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.

Course Name:	Building Self Confidence					
Course Code:	PPS 105	Credit Structure :	L	T	P	C
			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 Economics					
Course Code:	MGT 112	Credit Structure :	L	T	P	C
			3	0	0	3

Course Description: The objective of this Course is to enable engineering students to analyze cost / revenue data and make an economic analysis, which can help in the decision making process either to justify or reject alternative projects. This Course is designed to present the concepts and techniques of economic analysis needed in the decision making process. The emphasis is on the analytical analysis of money and its impact on decision making

The Course introduces the student to the discipline of economics and its application in the field of engineering. The Course examines the concept of time value of money and how engineers can apply it for making economic decisions. It also explains how interest rates and different compounding periods influence the value of various capital expenditures. The Course also deals with the effect of depreciation, taxes and inflation on capital expenditure decisions. .

Text Book (s):

Niall M Fraser, "*Engineering Economics*", Pearson.

Reference Book (s):

1. Jose Sepulveda, " *Schaum's Outline of Engineering Economics*", McGraw-Hill.

2. Tara Chand*, "Engineering Economics"* ,Vol-1, Nem Chand and Brothers.

Course Name:	Digital Entrepreneurship					
Course Code:	MGT 113	Credit Structure :	L	T	P	C
			3	0	0	3

Course Description: The objective of the Course on entrepreneurship will be on creating a learning system through which engineering students can acquaint themselves for starting new ventures and introducing new product and service ideas.

Entrepreneurship is the most powerful economic fore known to humankind. The process of transforming creative ideas into commercially viable business continues to be a major force in today's world economy. Successful entrepreneurship requires more than merely luck and money. It is a cohesive process of creativity, risk taking, and planning. This Course gives an overall basic framework for understanding the process of entrepreneurship.

The Course includes topics such as Understanding the entrepreneurial mind set, Launching Entrepreneurial Ventures, The Search for Entrepreneurial Capital, Formulation of Entrepreneurial Plan.

Text Book(s):

D.F. Kuratko, T V Rao,*" Entrepreneurship- A South Asian Perspective",*Cengage Learning**.**

Reference Book(s):

1.Robert D. Hisrich, Michael P. Peters and Dean A. Shepherd, *"Entrepreneurship"*, McGraw-Hill International.

2. Thomas W. Zimmerer, Norman M. Scarborough, *"Essentials of Entrepreneurship and Small Business Management"*, Pearson International Edition.

Course Name:	Professional Practice – II					
Course Code:	PIP 102	Credit Structure :	L	T	P	C
			-	-	-	15

Course Description: Professional Practice- II is the necessary for the subsequent problem solving experience after PP-I. Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems.

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Course Name:	Professional Practice - I					
Course Code:	PIP 101	Credit Structure :	L	T	P	C
			-	-	-	5

Course Description: The Professional Practice (PP) links the university with the professional world, by infusing the reality of the world of work into the educational process. The classroom is shifted for a period of two months in PP- I and another two months in PP-II to a professional location where the students, under the supervision of the faculty, are involved in applying the knowledge acquired in the classroom to finding solutions to real life problems. The PP programme has two components, namely PP-I of two months duration implemented during the summer following the 2nd year and PP- II two months duration implemented during either of the semesters of the final year.

PP-I is the first exposure to the world of work, necessary for the subsequent problem solving experience during PP-II. It is implemented at large industrial complexes, research and development centres, software development houses, pharmaceutical companies, etc. While the general aim of PP-I is to afford an opportunity for the student to learn how work is organized and carried out; by a process of observation and participation, the learning can be quite varied and exhaustive depending on the nature of the organization. It provides an opportunity for a detailed understanding of vast engineering operations and its various facets such as inventory, productivity, management, information systems, human resource development, etc.

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Course Name:	Engineering Chemistry					
Course Code:	CHE 101	Credit Structure :	L	T	P	C
			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.

Reference Books:

1. Dr. K. Pushpalatha, "Engineering Chemistry", Revised Edition, Wiley.
2. 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).

Course Name:	Elements of Electronics Engineering					
Course Code:	ECE 101	Credit Structure :	L	T	P	C
			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.

REGISTRAR

PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Name:	Elements of Mechanical Engineering					
Course Code:	MEC 101	Credit Structure :	L	T	P	C
			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.

REGISTRAR

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Course Name:	Environmental Science and Disaster Management					
Course Code:	CIV 102	Credit Structure :	L	T	P	C
			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.

Reference Books:

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

PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Name:	Technical Spoken Communication					
Course Code:	ENG 104	Credit Structure :	L	T	P	C
			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 self-belief. 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 middle-higher level management in the corporate world.

Reference Books:

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.

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Course Name:	Kannada Kali					
Course Code:	KAN 101	Credit Structure :	L	T	P	C
			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.

REGISTRAR

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Course Name:	Computer Programming					
Course Code:	CSE 151	Credit Structure :	L	T	P	C
			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.

REGISTRAR

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Course Name:	Engineering Chemistry Lab					
Course Code:	CHE 151	Credit Structure :	L	T	P	C
			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.

REGISTRAR

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Course Name:	Calculus, Differential Equations and Complex Variables					
Course Code:	MAT 102	Credit Structure :	L	T	P	C
			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.

Reference Books:

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.

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Course Name:	Effective Communication					
Course Code:	PPS 106	Credit Structure :	L	T	P	C
			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	Credit Structure :	L	T	P	C
			0	0	2	0

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"*

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Course Name:	Being Corporate Ready					
Course Code:	PPS 108	Credit Structure :	L	T	P	C
			0	0	2	0

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				
Course Pre-requisites	NIL				
Anti-requisites	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:					

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Module 1	Introduction to Principles of Programming	Assignment	Programming	**No. of Classes:10**
Topics: Problem Solving using algorithms & Flowchart, Types of Programming Languages, Design Methodologies, Environment set up to run a program, Program Execution and Translation process. Command Line Arguments.				
Module 2	Data Types, Variables and Control Statements	Assignment	Programming	**No. of Classes:6**
Topics: Data types, Variables, Identifiers, Operators, Assignments and Expression, Basic Input/ Output, Functions, Control Statements: Branching and Looping.				
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.				

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Module 5	Exception Handling and Input Output Streams	Assignment	Programming	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.

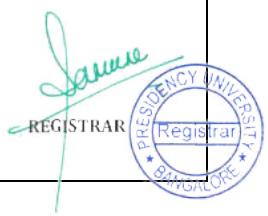
Experiment No. 5: Programming assignment using Interface

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.

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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 prepared by	Ms. Vinitha Dominic 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 Code: CSE1002	**Course Title:** Programming using Python **Type of Course:** School Core Theory & Integrated Laboratory	**L- P- C**	1	2	2
Version No.	1.0				
Course Pre-requisites	Basic knowledge of Computers and Mathematics				
Anti-requisites	**NIL**				
Course Description	The purpose of this course is to enable the students to develop python scripts using its basic programming features and also to familiarize the Python IDLE and other softwares. This course develops analytical skills to enhance the programming abilities. The associated laboratory provides an opportunity to validate the concepts taught and enhances the ability to build real time applications.				

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Course Outcomes	**On successful completion of this course the students shall be able to:** 1. Summarize the basic Concepts of python. 2. Demonstrate proficiency in using data structures. 3. Illustrate user-defined functions and exception handling. 4. Identify the various python libraries.			
Course Content:				
Module 1	Basics of Python programming	Assignment	Programming	**14 Classes**
Topics: Data types, operators and Expressions, Input and Output Statements. Control Structures – Selective and Repetitive structures				
Module 2	Indexed and Associative Data Structures	Simple applications	Programming	**20 Classes**
Topics: Strings, Lists, Sets, Tuples, Dictionaries				
Module 3	Functions, Exception handling and libraries	Case study	Programming	**10 Classes**
Topics: User defined functions, exception handling, Introduction to python built-in libraries				

List of Laboratory Tasks:

Sl. No.	Experiment Name
1	PROGRAMS ON OPERATORS AND EXPRESSIONS Level - 1 : Basic programs on Operators and Expressions Level - 2 : Develop applications to solve mathematical equations
2	PROGRAMS ON CONTROL STRUCTURES Level - 1 : Basic programs on Control structures Level - 2 : Create applications to solve the real time problems
3	PROGRAMS ON SELECTIVE AND REPETITIVE STRUCTURES Level - 1 : Basic programs on Selective and Repetitive structures Level - 2 : Create applications to solve the real time problems
4	PROGRAMS ON STRINGS Level - 1 : Basic programs on Strings and its manipulation Level - 2 : Develop Real world applications that involves string matching
5	PROGRAMS ON LISTS, TUPLES and SETS Level - 1 : Basic programs on lists, Tuples and Sets

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	Level - 2 : Create applications that involves sequential and Random access of data
6	PROGRAMS ON DICTIONARIES Level - 1 : Basic programs on dictionaries Level - 2 : Create applications that involves structuring of data.
7	PROGRAMS ON FUNCTIONS Level - 1 : Basic programs on Functions Level - 2 : Develop Real world applications using functions
8	PROGRAMS ON EXCEPTION HANDLING Level - 1 : Basic programs on exception handling Level - 2 : Develop applications that involves exception handling
9	BASIC PROGRAMS ON BUILT-IN LIBRARIES Level - 1 : Basic programs on python modules Level – 2: Develop applications using python libraries

Targeted Application & Tools that can be used:

Targeted Application : Web application development, AI, Operating systems

Tools: Python IDLE, ANACONDA

- **Application Areas:**
- Web Development
- Game Development
- Scientific and Numeric Applications
- Artificial Intelligence and Machine Learning
- Software Development
- Enterprise-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

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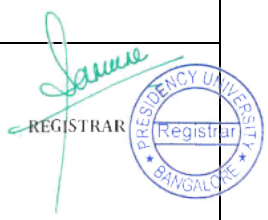
Text Books:

• 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. https://practice.geeksforgeeks.org/courses/Python-Foundation
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, Skill Development, Employability

Catalogue prepared by	Prof. Isaac Joel Raj. S, Ms. GANGA V C, Ms. PALLAVI M, Ms.AKSHATHA Y, Mr.JOBIN THOMAS, Ms. POORNIMA 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 **Type of Course:1] Program Core** **2] Laboratory only**	**L- P- C**	0	2	1
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**				
Course Description	**Course description:** Computer hardware workshop course is designed to train students to **identify and handling 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 Comes	On successful completion of the course the students shall be able to: 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 clock, overheating of PC, dysfunctional of USB port) **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 02:** Partitioning the hard disk and Installation of Linux Operating system. **Experiment N0 8:** **1 Lab Session** To share folders and control the resources through network. **Level No 01:** Sharing of folders, printers and scanners **Level No 02:** Granting privileges to access resources.

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Targeted Application & Tools that can be used: Targeted employment sector is processor manufacturing and memory chip fabrication vendors like Intel, AMD etc. Targeted job profiles include hardware engineers and network administrator. **Speccy- is a free system information tool. That gives information about design, portable support and a detailed list of hardware and software components.** **ASTRA32- is a free system information tool that shows detail on numerous devices and other parts of the system.**
Text Book- Govindarajulu. B., IBM PC and Clones Hardware trouble shooting and maintenance, McGraw Hill, New Delhi, Mueller.S, Upgrading and repairing PCS, 4th Edition, Prentice Hall.
References https://www.cpuid.com/softwares/cpu-z.html https://www.chtips.com/
Entrepreneurship: Students can become entrepreneur in the computer hardware field. **Skill Development:** Practical hands on assembling, troubleshooting makes them computer hardware professionals. **Human Values & Professional ethics:** Set of standard procedures to assemble and trouble shoot the computer hardware components.

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: CSE2001	**Course Title: Data Structures and Algorithms** **Type of Course: School Core** **Theory-Integrated Laboratory**	**L- P- C**	2	2	3
Version No.	1.0				
Course Pre-requisites	**Java or Python**				
Anti-requisites	**NIL**				

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<table>
<tr><td>Course Description</td><td colspan="4">The purpose of the course is to provide the fundamental concepts of data structures and algorithm, to emphasize the importance of choosing an appropriate data structure and algorithm for program development.
The student should have basic programming skills, to solve engineering/computational problems.
The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.
With a good knowledge in the fundamental concepts of data structures and algorithm the student can gain practical experience in implementing them, enabling the student to be an effective designer, developer for new software applications.</td></tr>
<tr><td>Course Outcomes</td><td colspan="4">On successful completion of this course the students shall be able to:
1. Implement modularized solutions for given problem using fundamental data structures.
2. Apply an appropriate linear data structure for a given computation.
3. Apply an appropriate non-linear data structure for a given computation
4. Analyze complexity of given searching and sorting algorithms.</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Fundamentals of Data Structure (Comprehension)</td><td>Assignment</td><td>Programming Task</td><td>06 Classes</td></tr>
<tr><td colspan="5">Topics:
Data Management concepts, Data types – primitive and non-primitive, Types of Data Structures- Linear & Non Linear Data Structures. Recursion: Recursive Definition and Processes, Programming examples. Fundamentals of Algorithmic problem solving, Important Problem types.</td></tr>
<tr><td>Module 2</td><td>Linear Data Structure Stack, Queues & Linked List (Application)</td><td>Case Study</td><td>Programming Task</td><td>08 Classes</td></tr>
<tr><td colspan="5">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.
Linked List- Singly Linked List, Operation on linear list using singly linked storage structures, Doubly Linked List, Circular List, Applications of Linked list.</td></tr>
<tr><td>Module 3</td><td>Non-linear Data Structures – Trees (Application)</td><td>Assignment</td><td>Programming Task</td><td>04 Classes</td></tr>
<tr><td colspan="5">Topics:
Introduction to Trees, Binary tree: Terminology and Properties, Binary tree traversals: Pre-Order traversal, In-Order traversal, Post-Order traversal.</td></tr>
</table>

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Module-4	Non-linear Data Structures –Graphs (Comprehension)	Assignment	Programming Task	**03 Classes**
Topics: Graph – Basic Concept of Graph Theory and its Properties, Representation Of Graphs.				
Module-5	Searching & Sorting Performance Analysis and Management (Comprehension)	Assignment	Programming Task	**06 Classes**
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 Classes]**

To implement the programs on Queue.

Level 1: Implement all the operations of the Queue
Level 2: Issuing token for doctor appointment.

Lab sheet 5: **[06 Classes]**

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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 6: **[04 Classes]**

To implement the Programs on Trees and Traversals

Level 1: Implement construction of the Binary tree.
Level 2: Implement tree traversals.

Lab sheet 7: **[2 Classes]**
To study and implement the Programs on Graphs.
Level 1: Program to implement graph

Lab sheet 8: **[6 Classes]**
To analyze time complexity and implement the Programs on searching and sorting.
Level 1: Program on searching and sorting.
Level 2: To analyze the time complexity.

Targeted Application & Tools that can be used:

System software and Application software Programming
Professionally Used Software : Eclipse / Jupyter notebook IDE

Project work/Assignment:

1. **Problem Solving: Choose an appropriate data structure and implementation of programs.**
2. **Programming: Implementation of given scenario using Java or python**

REFERENCE MATERIALS: Text Book(s):

1. R. Venkatesan, S. Lovelyn Rose, "Data Structures" Wiley, Second edition, January 2019.

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

References

1. Kurt Mehlhorn, and Peter Sanders – Algorithms and Data Sturctures The Basic Toolbox, Springer-Verlag Berlin Heidelberg, 2008.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI Learning Private Limited.

Topics relevant to development of **"Foundation Skills":** Fundamentals of Data structure, **"Skill Development" –** Implementation Linear and nonlinear data structure, **"Employability"**-Linear & Nonlinear Data Structure

Catalogue prepared by	Dr. Nagaraja S R Mr. Asif Mohamed H B Mr. Amogh Pramod Kulkarni Mrs. Yashaswini K A Dr. Mahalakshmi R

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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: CSE2006	**Course Title: Data Structures** **Type of Course: Program Core Theory-Integrated Laboratory**	**L- P- C**	2	4	4
Version No.	1.0				
Course Pre-requisites	Introduction to Programming				
Anti-requisites	**NIL**				
Course Description	**The purpose of the course is to provide the fundamental concepts of data structures and to emphasize the importance of choosing an appropriate data structure and technique for program development.** **The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.** **With a good knowledge in the fundamental concepts of data structures and practical experience in implementing them, the student can be an effective designer, developer for new software applications.**				
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. **Implement modularized solutions for given problem using fundamental data structures such as arrays, structures.** 2. **Apply an appropriate linear data structure for a given computation.** 3. **Apply an appropriate non-linear data structure for a given computation** 4. **implement graph operations, graph traversals and applications.**				
Course Content:					
Module 1	Fundamentals of Data Structure (Comprehension)	Assignment	Programming Task	**10 Hours**	
Topics: Data Management concepts, Data types – primitive and non-primitive, Types of Data Structures- Linear & Non Linear Data Structures. Recursion: Recursive Definition and Processes, Programming examples. Hashing: Advantages, Disadvantages, and Applications.					
Module 2	Linear Data Structure Stack, Queues (Application)	Assignment	Programming Task	**6 Hours**	

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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	Linear Data Linked List (Application)	Assignment	Programming Task	**08 Hours**

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**

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 Structures – Graphs (Comprehension)	Assignment	Programming Task	**06 Hours**

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: **[6 Hours]**

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: **[04 Hours]**

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.

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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 memory allocation.
Level 2: a) Implement a simple banking program using pointers.

a) Implement a program to prepare grocery list that vary every month.

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.

Level 1: Implement all the operations of the Queue
Level 2: Implement all the operations of the Circular Queue.
Issuing token for doctor appointment.

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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: **[6 Hours]**
To study and implement the Programs on Graphs.
Level 1: Program to implement graph
Level 2: Implement Depth first & breadth first search

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 implementation of programs.**
4. **Programming: Implementation of given scenario using C or C++.**

REFERENCE MATERIALS: Text Book(s):

3. R. Venkatesan, S. Lovelyn Rose, "Data Structures" Wiley, Second edition, January 2019.

4. Seymour Lipschutz ,"Data Structures with C" (Schaum's Outline Series) McGraw Hill Education, July 2017

References

1. Robert L Kruse, Bruce P Leung and Clovis L Tondo, *"Data Structures and Program Design in C"*, Pearson.
2. Richard F Gilberg and Behrouz A Forouzan, *"Data Structures: A Pseudocode Approach with C", Second Edition, Cengage learning*.

Topics relevant to development of **"Foundation Skills":** Fundamentals of Data structure, **"Skill Development" –** Implementation Linear and non linear data structure, **"Employability"**-Linear & Non linear Data Structure

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Catalogue prepared by	Dr. Nagaraja S R Asst.Professor, Dept of CSE Dr. Blessed Prince P Associate Professor, CSE
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: CSE2007	**Course Title:** Design and Analysis of Algorithms **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: 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. 4) Summarize the performance of various real time problems using different algorithmic techniques.				
Course Content:					

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Module 1	Design of basic Tree and Graph problems	Assignment	Problem Solving	**08 Hours**
Topics: Fundamentals of Algorithmic Problem Solving, Important Problem Types-Sorting, Searching, String Processing, Graph Problems, Combinatorial Problems, Fundamental Data Structures -Linear Data Structures, Graphs, Trees, Sets and Dictionaries. [Blooms 'level selected: C**omprehension**]				
Module 2	Analysis of Recursive and Non-recursive algorithms	Term paper/Assignment	Programming/ Problem Solving	**06Hours**
Topics: Algorithm Design paradigms - motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptotic Notations. Recurrences- substitution method. [Blooms 'level selected**: Comprehension**]				
Module 3	Divide-and-conquer	Term paper /Assignment	Programming/Problem Solving	**06 Hours**
Topics: Structure of divide-and-conquer algorithms: examples; Binary search, quick sort, Merge sort, Binary Tree Traversals and Related Properties, Strassen's Multiplication. [Blooms 'level selected: **Application**]				
Module 4	Greedy Algorithms and Dynamic Programming	Term paper /Assignment	Problem Solving	**08Hours**
Topics: **Greedy Algorithms :** Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm. **Dynamic Programming :** The Knapsack Problem, Binomial coefficient, Warshall's and Floyd's Algorithms, Travelling sales person problem. [Blooms 'level selected: **Application]**				
Module 5	Backtracking and Limitations of Algorithm	Term paper /Assignment	Problem Solving	**06Hours**
Backtracking – n-Queens problem. Lower-Bound Arguments, Decision Trees, P , NP , and NP-Complete Problems, [Blooms 'level selected: **Comprehension**]				
List of Laboratory Tasks: **Experiment No 1:** Apply non recursive algorithmic designing technique to solve Linear Search, finding max element problem and calculate the time efficiency (best, average & worst). **.[2 hours : Application Level]** **Level 1: understanding and designing the algorithm.**				

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Level 2: Implementing the algorithm and finding its efficiency.

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]**

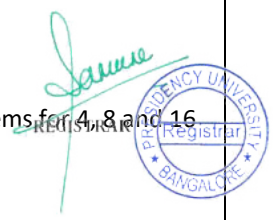
Level 1: understanding and designing the algorithm.
Level 2: Implementing the algorithm and finding its efficiency.

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 16 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 the Board of Studies on	Mention the BOS Number and the Date of BOS
Date of Approval by the Academic Council	Mention the Academic Council Meeting No. & the date of the meeting:

Course Code: **CSE2008**	**Course Title: Programming in Java (Object Oriented Programming)** **Type of Course: Program Core** **Theory and Laboratory Integrated**	**L-P-C**	1	4	3
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				

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 desktop 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.			
Course 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,				
Module 2	Arrays, Strings, inheritance and Polymorphism	Assignment	Programming	**No. of Classes: 6**
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 3	Interfaces, Packages and Exception Handling	Assignment	Programming	**No. of Classes: 8**
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.

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

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

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

Experiment No. 4: Programming assignment using Exception Handling

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

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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 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.

Topics relevant to " 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:** Computer Organization and Architecture **Type of Course:** Program Core & Theory only	**L- P- C**	3	0	3
Version No.	1.0				
Course Pre-requisites	**Digital Design** Basic concepts of number systems, logic gates, basic arithmetic operations				
Anti-requisites	**NIL**				
Course Description	This course introduces the core principles of computer architecture and organization from basic to intermediate level. This theory based course emphasizes on understanding the interaction between computer hardware and software. It equips the students with the intuition behind assembly-level instruction set architectures. It helps the students to interpret the operational concepts of computer technology as well as performance enhancement.				
Course Outcomes	On successful completion of the course the students shall be able to: 1] Describe the basic components of a computer, their interconnections, and instruction set architecture 2] Apply appropriate techniques to carry out selected arithmetic operations 3] Explain the organization of memory and processor sub-system				
Course Content:					
Module 1	Basic Structure of computers	Assignment	Data Analysis task		**9 Classes**
Topics: Functional Units, Basic Operational concepts, Bus Structures, Performance, Generation of Computers.					
Module 2	Instruction Set Architecture and I/O Unit	Assignment	Analysis, Data Collection		**9 Classes**
Topics: Instruction Set Architecture: Instructions types and Instruction Sequencing, Instruction formats, Addressing Modes, Stacks and Subroutines. Input/output Design: Accessing I/O Devices, I/O communication, Interrupts, DMA.					
Module 3	Arithmetic and Memory unit	Case Study	Data analysis task		**9 Classes**

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Topics:
Design of Fast Adders, Signed-Operand Multiplication, Fast Multiplication, Integer Division, and Floating point operations.
Memory System: Basic Concepts, Internal Organization of Memory chips, Read Only Memories, Memory Hierarchy, Cache Memories.

Module 4	BPU and Pipelining	Assignment	Analysis, Data Collection	**10 Classes**

Topics:
Basic Processing Unit: Fundamental Concepts, Single Bus organization, Control sequence, Execution of a Complete Instruction, Multiple Bus Organization.

Pipelining: Overview of pipelining, 5 stage instruction pipeline, Hazards.

Targeted Application & Tools that can be used:

Targeted employment sector is processor manufacturing and memory chip fabrication vendors like Intel, AMD, Motorola, NVidia, Samsung, Micron Technology, western Digital etc. Targeted job profiles include Memory circuit design and verification engineers, Physical system design engineer, System programmer, Fabrication engineer etc.

Tools:

- Simplescalar/Simwatch
- EasyCPU for the Intel 80X86 family of computer architecture
- RTLsim a data-path simulator for a MIPs like CPU
- RISC-V for ARM like RISC processors

Project work/Assignment:

Mini Project:

- Model a virtual computer system with the standard memory hierarchy having a layered cache with branch predictors and cache replacement/insertion policies

Term Assignments:

- **Comparative analysis of instruction set architecture (ISA) of CISC and RISC processors**

  Carry out a thorough analysis of the internal organization and Instruction set Architecture of state-of the art CISC processors like VAX, PDP-11, Motorola 68k, Intel's x86 and the best in the market 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: 12th BOS, held on XX/XX/XX
Date of Approval by the Academic Council	Academic Council Meeting No. 14, Dated XX/XX/XX

Course Code: CSE2010	**Course Title: Operating Systems** **Type of Course: Program Core and Theory Only**	**L- P- C**	3	0	3
Version No.	1.0				
Course Pre-requisites	[1] Programming fundamentals: Pseudocode, Data Types and Operators, Selection Control Structures, Functions, Loops, Arrays, Structures. [2] C programming syntax and semantics [3] Data Structures: pointers, stacks, queues, linked lists				
Anti-requisites	**NIL**				
Course Description	**The purpose of this course is to enable the students to understand the need for Operating systems and to develop the basic concepts of process management, Synchronization and memory management. The course is both conceptual and analytical in nature towards Managing the Process and Memory and needs fair knowledge of programming fundamentals, C programming and data structures. The course develops the critical thinking and analytical skills on allocating and managing resources. The course also enhances the problem solving and systems programming abilities through assignments.**				
Course Out Comes	On successful completion of the course the students shall be able to: 1] Describe the fundamental concepts of Operating Systems. 2] Solve problems on various CPU Scheduling Algorithms. 3] Apply different techniques on to a various synchronization problems. 4] Discuss various memory management techniques.				

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Course Content:				
Module 1	Introduction	Assignment	Programming/Data Collection	**9 Hours**
Topics: Introduction to OS – Computer System Architecture , Operating System Structure, Operations,– Different management activities handled by the OS, Computing environments, Operating System Services, User and OS interface, System Calls and its types, System Programs[loaders, linkers...], Overview of OS design and implementation.				
Module 2	Process Management	Coding Assignment/Case Study	Pseudocode/Programming	**9 Hours**
Topics: Process Concept, Operations on Processes, Inter Process Communication, Introduction to threads - Multithreading Models, Process Scheduling– Basic concepts, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, SRTF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue.				
Module 3	Process Synchronization and Deadlocks	Coding Assignment/Case Study	Pseudocode/Programming	**9 Hours**
Topics: The Critical-Section Problem- Peterson's Solution, Synchronization hardware, Mutex locks, Semaphores, Monitors, Classical Problems of Synchronization. Introduction to Deadlocks, Deadlock Characterization, Methods for handling deadlock: Deadlock Prevention- Deadlock Avoidance- Deadlock detection & Recovery from Deadlock.				
Module 4	Memory Management	Assignment/Case Study	Programming/Simulation/Data Collection	**9 Hours**
Topics: Introduction, Swapping, Contiguous and Non-Contiguous Memory Allocation, Segmentation, Paging - Structure of the Page Table – Demand Paging – Page Replacement, Allocation of Frames – Thrashing.				
Targeted Application: **Real time Applications such as traffic management system, banking system, health care and many more systems where there are entities that use and manage the resources.** **Software Tools:** 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 prepared by	Mr Sunilkumar Teggihalli, Mr Asif Mohamed H B, Mrs Sneha S Bagalkot, Mr Rupam Bhagawati.
Recommended by the Board of Studies on	BOS NO: 11 th. BOS to be held
Date of Approval by the Academic Council	Academic Council Meeting No. 14 to be held

Course Code: CSE2012	**Course Title: Database Management Systems** **Type of Course:Program CoreTheory–Laboratoryintegrated**	**L-P-C**	2	4	4

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Version No.	1.0				
Course Pre-requisites	Data Structures and Algorithms – Different ways of organizing the data and Selection methods.				
Anti-requisites	NIL				
Course Description	This course introduces the core principles and techniques required in the design andimplementation of database systems. This introductory application-oriented course covers therelational database systems[RDBMS].More emphasis is set on how to organize, maintain and retrieve the information efficiently. It helps the students to learn and practice data modeling and database designs. The associated laboratory is designed to implement database design using structured query languages in information technology applications. All theexercises will focus on the fundamentals for creating sophisticated, interactive, and secure database applications.				
Course Out Comes	On successful completion of the course the students shall be able to: 1] Describe the core concepts of relational database management systems. 2] Illustrate the design principles for Database design, ER Models and Normalization. 3]. Demonstrate query evaluation and query optimization techniques. 4] .Describe the concepts of Transaction management. 5] Develop a commercial relational database system.				
Course Content:					
Module 1	**Introduction to databases and Relational Algebra**	Assignment	Programming task	**8 Classes**	
Introduction to Database: Characteristics of database approach, Codd's Rules, Data Models, Schemas, and Instances, Data Modelling using Entities and Relationships, Relational database design using ER- Relational mapping, Query By Example(QBE). Relational Algebra: Relational algebra operators, relational operations from set theory, binary relational operations: JOIN and DIVISION, examples of queries in relational algebra.					
Module 2	**Schema Refinement**	Assignment	Problem Solving	**8 Classes**	
Normal Forms based on Primary Keys- (1NF,2NF, 3NF), Boyce-Codd Normal Form, Multi valued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.					

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Module 3	**Query Processing And** Optimization	Assignment	Programming Task	**4 Classes**
Query Processing and Optimization: Query interpretation, Equivalence of expressions, Algorithm for executing query operations.				
Module 4	**Transaction Management.**	Assignment	Problem Solving	**6Classes**
Transaction and System concepts, Desirable properties of Transactions, Concurrency control and recovery techniques-characterizing schedules based on recoverability and Serializability, Deadlock Prevention Schemes.				

List of Laboratory Tasks:

Experiment No 1: To study and implement Data Definition Language commands of SQL**.[4 Classes]**

Level 1: Perform operations using Data Definition Language commands like Create**,** Alter and Drop on Student DB.

Level 2: Identify the given requirements; valid attributes and data types and Perform DDL operations on a given scenario. [Movie Databases]

Experiment No. 2: To implement Data Manipulation Language commands of SQL**. [4 Classes**

Level 1: Perform operations using Data Manipulation Language commands like INSERT, UPDATE and DELETE on Student DB.

Level 2: identify valid DML operations to manipulate the data inside the tables to achieve expected requirement. [Movie Databases]

Experiment No. 3. To implement different types of SQL constraints. **[4 Classes]**

Level 1: Create tables on Banking database using PRIMARY KEY, NOT NULL, UNIQUE, FOREIGN KEY and Other Constraints.

Level 2: Identify different types of data and referential integrity constraints based on the requirement and create the tables as per the given scenario.[Music Databases]

Experiment No. 4: To study and implement SQL data retrieval using SELECT**, FROM and WHERE clause. [4 Classes]**

Level 1: Illustrate the working of SELECT, FROM and WHERE clause on Banking Database.

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.

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

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

Course Code: CSE2018	**Course Title: Theory of Computations** **Type of Course: Program Core, Theory only Course**	**L- P- C**	3	0	3
Version No.	1.0				
Course Pre-requisites	[1] Discrete Mathematics [2] Data Structures				

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	Basic concepts from Set Theory Operations Union, Intersection, Set Difference and Stack Concepts from Data Structures.			
Anti-requisites	NIL			
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 analysis and to 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 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] 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. 4] Build Turing machine for a Language			
Course Content:				
Module 1	Finite Automata	Case Study	Simulation	**12 Classes**
Topics: Introduction to Automata Theory, Applications of Automata Theory, Basic definitions, Representation of automata, Language recognizers, Example for language Recognizers. Basic concepts of Finite automata, DFA- definitions of DFA, Deterministic Accepters Transition Graphs and Languages and DFA's, Regular Languages, NFA- Definition of a Nondeterministic Accepter, Languages and NFA's. Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata.				
Module 2	Regular Expressions & Context Free Grammar	Assignment	Programming	**6 Classes**
Topics: 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:

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:

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

Project work/Assignment:

1. 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.

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.

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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				
Anti-requisites	NIL				
Course Description	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.				
Course Out Comes	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)				

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	4. Explain the Basic Concepts of Data communication. (Comprehension)			
Course Content:				
Module 1	**Overview, Application and Transport Layers.**	Assignment	Problem Solving	**13 Classes**
Introduction: Computer Networks, Topologies, OSI Reference Model, TCP/IP model. Principles of Network Applications, The Web and HTTP, DNS—The Internet's Directory Service, Socket Programming: Creating Network Applications. Introduction and Transport-Layer Services, Connection-less Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control.				
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	**Data Link Layer**	Assignment	Problem Solving	**10 Classes**
Introduction to the Link Layer, The Services Provided by the Link Layer, Error-Detection and -Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC), Multiple Access Links and Protocols. Switched Local Area Networks, Link-Layer Addressing and ARP, Ethernet, Link-Layer Switches, Virtual Local Area Networks (VLANs),DHCP,UDP,IP and Ethernet.				
Module 4	**Physical Layer with Data Communication**	Assignment	Problem Solving	**07 Classes**
Data communications: Components, Data Representation, Data Flow, Analog and Digital Signals**,** Periodic Analog Signals: Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth, Digital Signals, Transmission Impairment, Data Rate Limits: Noiseless Channel, Nyquist Bit Rate, Noisy Channel: Shannon Capacity, Performance: Bandwidth, Throughput, Latency (Delay), Bandwidth-Delay Product, Parallel/Serial Transmission, Multiplexing: Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Synchronous Time-Division Multiplexing.				

Targeted Applications & Tools that can be used: Cisco Packet Tracer, Wireshark, and NS2.

Case Study/Assignment: Choose and analyze a network from any organization/Assignment proposed for this course in CO1-CO4

12. Problem Solving: Choose and appropriate devices and implement various network concepts.

13. Programming: Simulation of any network using NS2.

Text Book

T1. James F. Kurose, Keith W. Ross, "*Computer Networking A Top down Approach",* 8th Edition, Pearson, 2021.
T2. Behrouz A. Forouzan, "*Data Communications and Networking*", 6th Edition, Tata McGraw-Hill, 2021.

References

R1. William Stallings: "*Data and Computer Communication*", 10th Edition, Pearson Education, 2017.
R2. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2012.

Web Based Resources and E-books:
Digital Learning Resources (Library Resources)
W1. https://puniversity.informaticsglobal.com/login

Catalogue prepared by	14. Dr. Shamugarathinam 15. Dr. Ashish Kumar Srivastava 3. Ms. Prema Sindhuri 4. Ms. Bhavana A
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

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Course Code: CSE 2014	**Course Title: Software Engineering** **Type of Course: School Core [Theory Only]**	**L- P- C**	**3**	**0**	**3**

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 Comes	On successful completion of this course the students shall be able to: 1] Describe the Software Engineering principles, ethics and process models(Knowledge) 2] Identify the requirements, analysis and appropriate design models for a given application(Comprehension) 3] Understand the Agile Principles(Knowledge) 4] Apply an appropriate planning, scheduling, evaluation and maintenance principles involved in software(Application)			
Module 1	**Introduction to Software Engineering and Process Models (Knowledge level)**	Quiz		**09 Hours**
Introduction: Need for Software Engineering, Professional Software Development, Software Engineering Ethics, Software Engineering Practice-Essence of Practice, General Principles Software Development Life Cycle **Models:** Waterfall Model – Classical Waterfall Model, Iterative Waterfall Model, Evolutionary model-Spiral, Prototype.				
Module 2	**Software Requirements, Analysis and Design (Comprehension level)**	Assignment	Development of SRS documents for a given scenario	**11 Hours**
Requirements Engineering: Eliciting requirements, Functional and non- Functional requirements, Software Requirements Specification (SRS), Requirement Analysis and validation. Requirements modelling- Introduction to Use Cases, Activity diagram and Swim lane diagram. CASE support in Software Life Cycle, Characteristics of CASE Tools, Architecture of a CASE Environment. **Design:** Design concepts, Architectural design, Component based design, User interface design.				
Module 3	**Agile Principles & Devops (Knowledge level)**	Quiz		**09 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 Assurance**-Elements of software quality assurance, SQA Tasks, Goals and Metrics, Software configuration management- SCM process, SCM Tools (GitHub). **Maintenance-** Characteristics of Software Maintenance, Software Reverse Engineering, Software Maintenance Process Models.				

Targeted Application & Tools that can be used: Selenium, GitHub, CASE Tools
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course
1] Identification of Software Process Models for a given scenario 2] Development of SRS documents for a given scenario 3] Apply the white box and black box testing concepts using Programing 4] Installing Selenium/GitHub software and exploring the functionality
Text Book 1] Roger S. Pressman, "Software Engineering – A Practitioner's Approach", VII Edition, McGraw-Hill, 2017. 2] Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", VI Edition, McGraw-Hill, 2018.
References 1] Rajib Mall, "Fundamentals of Software Engineering", VI Edition, PHI learning private limited, 2015. 2] Ian Sommerville, "Software Engineering", IX Edition, Pearson Education Asia, 2011. 3] Agile Software Development Principles, Patterns and Practices.1st Edition, Wiley, 2002

Catalogue prepared by	Dr. S. Pravinth Raja, Associate Professor, CSE, SOE. Ms. Sweet Subhashree, Assistant Professor, CSE, SoE.
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 2018**	**Course Title: Theory of Computations**	**L- P- C**	3	0	3
Version No.	0.9				
Course Pre-requisites	NIL				
Anti-requisites	NIL				
Types of Skills	Foundation Skills, Analytical, Logical and Mathematical 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**
Topics: Introduction to Automata Theory, Applications of Automata Theory, Basic Definitions, Representation of Automata, Language Recognizers, Example for Language Recognizers. (Knowledge)				
Module 2	Finite Automata	Assignment	Simulation	**12 Hours**
Topics: Basic concepts of Finite automata, DFA- definitions of DFA, Deterministic Accepters Transition Graphs and Languages and DFA's, Regular Languages, NFA- Definition of a Nondeterministic Accepter, Languages and NFA's, Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata. (Application)				
Module 3	Regular Expressions &	Assignment	Programming	**8**

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	Context Free Grammar			**Hours**
Topics: Formal Definition of a Regular Expression, Pumping Lemma, Context Free Grammars-Examples of Context-Free Languages, Leftmost and Rightmost Derivations, Derivation Trees, Ambiguity in Grammars. (Comprehensive)				
Module 4	Push Down Automata	Assignment	Simulation	**7 Hours**
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, Deterministic Pushdown Automata. (Application)				
Module 5	Turing Machine	Assignment	Programming/Simulation	**6 Hours**
Topics: Definition of a Turing Machine, Turing Machines as Language Accepters, Example Languages to construct Turing Machine. (Application)				

Targeted Application & Tools that can be used:

Targeted Application:

[1] Text Processing
[2] Compilers
[3] Text Editors
[4] Robotics Applications
[5] Artificial Intelligence

Tools:

[1] JFLAP (Java Formal Language and Automata Package) Software simulation tool. It's interactive educational software written in Java to experiment topics in automata theory.

[2] Turing machine Online simulators.

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

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

Course Code: MAT2004	**Course Title: Discrete Mathematical Structures** **Type of Course: Program Core**	**L- P- C**	3	0	3
Version No.	1.0				
Course Pre-requisites	**Nil**				
Anti-requisites	**Nil**				
Course Description	The course provides insights into the fundamental aspects of mathematical logic and predicate calculus. The course delves deeply into the concepts of algebraic structures, lattices and Boolean algebras which are widely used in computer science and engineering. It also highlights the principles of counting techniques and their applications.				
Course Objective	The objective of the course is **Skill Development** of student by using **Participative Learning** techniques.				
Course Outcomes	On successful completion of the course the students shall be able to CO-1: Explain logical sentences through predicates, quantifiers and logical connectives. CO-2: Comprehend the basic principles of set theory and different types of relations. CO-3: Elucidate the concepts of lattices and Boolean algebra. CO-4: Deploy the counting techniques to tackle combinatorial problems.				
Course Content:					
Module 1	**Mathematical Logic and Predicate Calculus**				**12 Sessions**
Propositional Logic, propositional logic equivalences, normal forms, inference rules, introduction to proofs, conversion to clausal form, predicate calculus, the statement function, inference theory of the predicate calculus.					
Module 2	**Algebraic Structures**				**10 Sessions**
Sets and set operations, functions, relations and their properties & representations of relation by matrix, closure of different type of relations, equivalence relations, primitive recursive function.					
Module 3	**Lattices and Boolean Algebra**				**11 Sessions**

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Partial ordering, Posset, Lattices & Algebraic structures, Sub lattice, Basic properties of algebraic systems by lattices, Distributive lattices, complement of an element in a lattice, Boolean lattice & Boolean algebra, cancellation laws and unique complement theorem.

Module 4	Principles of Counting Techniques			12 Sessions

Chinese remainder theorem, Pigeonhole principle, generalized pigeonhole principle, mathematical induction, generalized permutations and combinations, recurrence relations.

Targeted Applications & Tools that can be used:

Discrete mathematics provides the mathematical foundations for many computer science courses including data structures, algorithms, database theory, automata theory, formal languages, compiler theory, computer security, and operating systems.

Tools used: MS-Excel / Mathematica / Maple

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

Assignment 1: Logical equivalences and predicate calculus.
Assignment 2: Equivalence relations and lattices.
Assignment 3: Recurrence relations.

Text Book

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, McGraw-Hill, 2011.

Reference Books:

1. Tremblay, J.P. and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", 30th Reprint, Tata McGraw Hill, New Delhi, 2011.
2. Grimaldi R.P., "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education, New Delhi, 2007.
3. Epp Susanna S, "Discrete Mathematics with Applications", 4th Edition, Cengage Learning, New Delhi, 2016.
4. Kolman Bernard, Busby Robert C and Ross Sharon Cutler," Discrete mathematical structures", 6th Edition, Pearson, India, 2015.
5. Liu, C L Mohapatra, D P.," Elements of Discrete Mathematics a Computer oriented approach", 4th Edition, McGraw Hill, New Delhi, 2015.
6. Richard Johnsonbaugh, Discrete Mathematics, 8th Edition, Prentice Hall, 2017.
7. Mott Joe L, Kandel Abraham, Baker Theodore P, "Discrete Mathematics for Computer Scientists and Mathematicians", 2nd Edition, Pearson, India, 2015.

E-Resources (https://presiuniv.knimbus.com)

1. https://open.umn.edu/opentextbooks/textbooks/394
2. https://open.umn.edu/opentextbooks/textbooks/237
3. https://directory.doabooks.org/handle/20.500.12854/45249

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Web Resources

1. https://discrete.openmathbooks.org/pdfs/dmoi-tablet.pdf
2. https://www.pdfdrive.com/discrete-mathematics-d24475492.html

3. https://www.cis.upenn.edu/~jean/discmath-root-b.pdf	
Video Lectures 1. https://www.youtube.com/watch?v=i3CpxxFedlA 2. https://www.youtube.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	8th BOS on 23rd July, 2022
Date of Approval by the Academic Council	18th AC on 3rd August 2022

Course Code: **CSE2013**	**Course Title:** **Cloud Computing** **Type of Course:** **Theory**	**L- P- C**	3	0	3
Version No.	**1.0**				
Course Pre-requisites	**[1] Data Communication and Computer Networks (CSE2011)**				
Anti-requisites	**NIL**				
Course Description	**This course provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). It dives into all of the details that a student needs to know in order to plan for developing applications on the cloud and what to look for when using applications or services hosted on a cloud.**				
Course Objective	**This course is designed to improve the learner's EMPLOYABILITY SKILLS using EXPERIENTIAL LEARNING techniques.**				
Course Outcomes	**Upon successful completion of the course the students shall be able to:** **6) Understand** the significance of Cloud computing technologies 7) **Identify** appropriate Virtualization techniques to virtualize infrastructures **8) Discuss** Cloud mechanisms to optimize the QoS parameters **9) Develop** applications using Cloud services and VM instances				
Course Content:					
Module 1	**Introduction to Cloud services**	Assignment	Theory		**No. of Classes:10**
Topics: Evolution of cloud computing, Computing Platforms and Technologies, Cloud Computing Architecture, IaaS, PaaS, SaaS, Types of Clouds, Cloud Computing Environments.					

Module 2	**Virtualization Techniques**	Assignment	Theory	**No. of Classes:10**
Topics: Basics of Virtualization - Types of Virtualizations, Taxonomy of Virtualization Techniques, Implementation Levels of Virtualization.				
Module 3	**Cloud QoS and Management**	Assignment	Theory	**No. of Classes:10**
Topics: Cloud Infrastructure Mechanisms, SLAs, Specialized Cloud Mechanisms, Cloud Management Mechanisms, Cloud Security Mechanisms				
Module 4	**Application development in Cloud**	Assignment	Case Study	**No. of Classes:10**
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:

Sl. No	Title
1	Install Virtualbox/VMware Workstation with different flavors of Linux or Windows OS on top o windows 11
2	Install a C compiler in the virtual machine created using a virtual box and execute Simple Progr
3	Install Google App Engine (GAE). Create a “hello world” application and other simple web 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.
7	Find a procedure to launch a virtual machine using Openstack
8	Demonstrate Migration, Cloning, and Snapshots within and across VMs

Text Book(s)

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "*Mastering Cloud Computing*", McGraw Hill Education, 2013 edition.
2. John Rittinghouse and James Ransome, "*Cloud Computing, Implementation, Management and Security*", CRC Press, 2010 edition.

References

1. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "*Cloud Computing Concepts, Technology & Architecture*", PHI publisher 2013 edition.
2. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "*Cloud Computing: A Practical Approach*", Tata McGraw-Hill, 2010 edition.
3. David E.Y. Sarna, "*Implementing and Developing Cloud Applications*", CRC Press, 2018 edition.
4. Manvi, Sunilkumar, and Gopal K. Shyam. "*Cloud Computing: Concepts and Technologies*". CRC Press, 2021.

Web Resources and Research Articles links:

1. IEEE Transactions on Cloud Computing- https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6245519
2. **International Journal of Cloud Computing**- https://www.inderscience.com/jhome.php?jcode=ijcc
3. CloudSim Resources- https://javadoc.io/doc/org.cloudsimplus/cloudsim-plus/latest/org/cloudbus/cloudsim/resources/class-use/Resource.html

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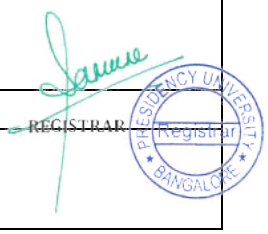
4. Journal of Network and Computer Networking- https://www.journals.elsevier.com/journal-of-network-and-computer-applications	
Catalogue prepared by	Dr. Gopal K. Shyam, Dr. Murali P., Mr. G Nagarajan
Recommended by the Board of Studies on	BOS NO: 19th BOS, held on 04/08/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/8/2022.

Course Code: **CSE2007**	**Course Title:** **Design and Analysis of Algorithms** **Type of Course:** **Program Core & Theory only**	**L- P- C**	3	0	3
Version No.	2.1				
Course Pre-requisites	CSE2001, Data Structure and Algorithms				
Anti-requisites	**NIL**				
Course Description	This intermediate course enables students to design and analyze efficient algorithms to solve problems. This course covers typical design methods such as divide-and-conquer, dynamic programming and greedy method to solve problems. The students shall develop strong analytical skills as part of this course.				
Course Objectives	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.				
Course Outcomes	**On successful completion of the course the students shall be able to:** **1] Identify the efficiency of a given algorithm. [Comprehension]** **2] Employ divide and conquer approach to solve a problem. [Application]** **3] Illustrate dynamic programming approach to solve a given problem. [Application]** **4] Solve a problem using the greedy method. [Application]** **5] Discuss the techniques to solve a real-world problem based on its complexity classes. [Comprehension]**				
Course Content:					
Module 1	Introduction to Algorithms	Assignment	Problem Solving		**06 Sessions**
Topics: Algorithm Design and efficiency, measuring of running time of algorithms. Insertion sort and merge sort. Asymptotic Growth and Notations. Recurrences--Masters method.					

Assignment: Comparatively evaluate bubble sort, insertion sort and mergesort.				
Module 2	Review of Searching and Sorting techniques	Assignment	Programming/ Problem Solving	**12 Sessions**
Topics: **Divide and Conquer:** Examples. Strassen's Matrix multiplication. **Sorting:** Quicksort, Heapsort, Lower bound of comparison-based sorting, non-comparison-based sorting: Radix sort. **Search:** Review of Linear Search and Binary Search, Hashing and hash tables. **Assignment:** Design and develop an algorithm using Divide and Conquer technique for a given scenario.				
Module 3	Greedy Algorithms	Assignment	Programming/ Problem Solving	**09 Sessions**
Topics: Introduction, Fractional Knapsack Problem, Minimal Spanning Tree: Prim's Algorithm and Kruskal's Algorithm, Single-source Shortest Path: Dijkstra's Algorithm. Huffman Codes. **Assignment:** Design and Develop a solution to a given scenario using greedy method.				
Module 4	Dynamic Programming	Assignment	Programming/ Problem Solving	**09 Sessions**
Topics: Introduction with examples, Principles of Memoization, 0-1 Knapsack Problem, Bellman-Ford algorithm, Floyd-Warshall's Algorithms. Optimal Binary Search Trees, Chain Matrix Multiplication. **Assignment:** For a given scenario, attempt the three design paradigms learned so far and argue the best approach to solve the problem				
Module 5	Complexity Classes and Heuristics	Assignment	Programming/ Problem Solving	**09 Hours**
Topics: plexity classes: P, NP, and NP-Complete Problems. Backtracking: n-Queens. Branch and bound: Travelling Salesman Problem. **Assignment:** Apply backtracking algorithmic designing technique for solving queen's problems for 4, 8 and 16 inputs.				
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: GCC compiler.**				
Project work/Assignment: 1. **Problem Solving: Design of Algorithms and implementation of programs.** 2. **Programming: Implementation of given scenario using Java.**				



Text Book: T1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *'Introduction to Algorithms'*, MIT Press, 2022. T2. J. Kleinberg and E. Tardos, *'Algorithm Design'*, Addison-Wesley, 2005.	
References R1. Anany Levitin, *'Introduction to the Design and Analysis of Algorithms'*, Pearson Education, 2003. R2. Tim Roughgarden, *'Algorithms Illuminated'* (books 1 through 3), Soundlikeyourself Publishing, 2017,18,19 respectively. R3. AV Aho, J Hopcroft, JD Ullman, *'The Design and Analysis of Algorithms'*, Addison-Wesley, 1974.	
Catalogue prepared by	Dr Sandeep Albert Mathias, Dr Murali Parameswaran
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 2021	Course Title:Data Mining TypeofCourse:Discipline Elective in Big Data Basket Theory Only	L-P-C	3	0	3
Version No.	1.1				
Course Pre-requisites	MAT1001 – Linear Algebra and Calculus				
Anti-requisites	NIL				
Course Description	This course introduces an extensive study on data pre-processing and classification algorithms.Thiscourse 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 courseemphasizes 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.				

<table>
<tr><td>Course Out Comes</td><td colspan="4">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] Discussdifferent 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]</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Introduction to Data Mining</td><td>Assignment</td><td>Data Collection</td><td>6 Sessions</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td>Module 2</td><td>Data Preprocessing</td><td>Quiz</td><td>Problem Solving</td><td>7 Sessions</td></tr>
<tr><td colspan="5">Topics:Types of data – Data Quality – Data Pre-processing Techniques – Similarity and Dissimilarity measures.</td></tr>
<tr><td>Module 3</td><td>Data Mining – Frequent Patterns</td><td>Assignment</td><td>Problem Solving</td><td>7 Sessions</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td>Module 4</td><td>Classification</td><td>Assignment</td><td>Problem Solving</td><td>8 Sessions</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td>Module 5</td><td>Cluster AnalysisMethods and Pattern Mining</td><td>Assignment</td><td>Problem Solving</td><td>8 Sessions</td></tr>
</table>

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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 theProcess of data mining in the Employee database.

Assignment:

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}	Items
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

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http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=4001&query_desc=ti%2Cwrdl%3A%20Data%20Mining%3A%20Concepts%20and%20Techniques	
Topics relevant to development of "EMPLOYABILITY SKILL":Data Mining Techniques,FP Growth.	
Catalogue prepared by	Dr. GowthulAlam M M
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: CSE2027	**Course Title: Fundamentals of Data Analytics** **Type of Course: Theory only**	**L- P- C**	3	0	3
Version No.	1.0				
Course Pre-requisites	NIL				
Anti-requisites	NIL				
Course Description	Fundamentals of Data Analytics is designed for inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, and supports in decision-making. The course begins by covering Data extraction, pre-processing, and transformation. It delivers the basic statistics and taught in an intuitive way to analysis the data. This course will help the students to apply the knowledge on data analysis to a wide range of applications.				
Course Out Comes	On successful completion of the course the students shall be able to: 1**) Explain different types of data and variables.** **2) Interpret data using appropriate statistical methods.** **3) Apply the Data Analysis techniques by MAT Lab** **4) Demonstrate the collection, processing and analysis of data for any given application and Illustrate various charts using visualization methods.** **5) Apply Regression models to analysis of data.**				

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Course Content:				
Module 1	Introduction to Data Analysis	Assignment	Data Collection , data analysis	**8 Hours**
***Topics**: Introducing Data, overview of data analysis: Data in the Real World, Data vs. Information, The Many "Vs" of Data, Structured Data and Unstructured Data, Types of Data, Data Analysis Defined, Types of Variables, Central Tendency of Data, Scales of Data, Sources of Data, Data preparation: Cleaning the data, Removing variables, Data Transformations.*				
Module 2	Statistical functions	Assignment	Data analysis	**8 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.				
Module 3	Introduction to MAT Lab	Project based MAT Lab	MAT LAB	**9 Hours**
Topics: Preprocessing Data, Graphics Formatting Functions, Importing Data From Multiples Files, Analyzing Groups within Data, Customizing Graphics with in Data, Customizing Graphics Objects, Images and 3-D Surface plots and Importing Unstructured Data.				
Module 4	Data Collection, Processing and Analysis	Project MAT Lab	Data Collection, visualization and data analysis	**8 Hours**
Topics: Collection of Primary Data(Observation Method, Interview Method, Collection of Data through Questionnaires ,Collection of Data through Schedule) Difference between Questionnaires and Schedules, Some Other Methods of Data Collection, Collection of Secondary Data ,Difference between Survey and Experiment Processing Operations, correlation.				
Module 5	Data Visualization and Charting Prediction	Project MAT Lab	Data analysis with optimization	**12 Hours**
Topics: Types of charts and their significance, Organize data interactively with tables , Visualizing data with charts, Analyzing data with pivot tables, Build presentation ready dashboards and turn real world data into business insights, Tracking trends and making forecasts, Interpretation and report writing Introduction: Overview, Classification, Regression, Building a prediction model, Applying a prediction Model, Simple Linear Regression, Simple Non Linear Regression.				
Targeted Application & Tools that can be used: **Application Area are** **Decision making in business, health care, financial sector, Medical diagnosis etc...**				

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MAT Lab

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

1. Collect student marks of test1 and apply inferential and descriptive statistics.
2. Identify the problem in any of the business and make one objective, collect the relevant data and analyses using visualization.
3. Collect the data related to agriculture production and sales and predict the values with linear regression.
4. Taking the KPI data create the interactive dashboards for different companies.

Text Books

1. **Glenn J. Myatt and Wayne P. Johnson, "Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining Paperback", Import, 22 July 2014.**
2. William Menke And Joshua Menke,"Environmental Data Analysis with MAT Lab", Elsevier, 2012.

References

1. Paul McFedries , "Excel Data Analysis-visual blue print",Wiley 4th Edition September 2019.
2. Gerald Knight, "Analyzing Business Data with Excel",O'Reilly; 1st Edition,13 January 2006.
3. https://people.highline.edu/mgirvin/AllClasses/348/348/AllFilesBI348Analytics.htm
4. Hansa Lysander,"Data Analysis and business modelling using Microsoft Excel", PHI, 2017.

Topics relevant to development of "FOUNDATION SKILLS": Statistical Concepts for data, visualization techniques.
Topics relevant to "HUMAN VALUES &PROFESSIONAL ETHICS": Data collection for project based assignments.

Catalogue prepared by	Dr. A Jayachandaran and Dr. R Vignesh
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

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Course Code: CSE 2066	**Course Title**: Computer Graphics	**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 basics of graphics and visualization in computer science, enabling students to appreciate how the computer system displays graphics and visual effects on a display device. This course includes Theoretical elements, and addresses basic knowledge of high school geometry and Linear Algebra. The course uses assignments to develop visualization skills of the students. The key topics covered in this course include algorithms for drawing basic primitives, transformations, viewing and clipping for both 2D and 3D objects along with Bezier curves and Surfaces.				
Course Objective	The objective of the course is to develop skill for students on learning algorithms on transformation / Viewing/ Clipping on 2Dd and 3D objects by using Participative Learning techniques.				
Course Out Comes	On successful completion of the course the students shall be able to: CO 1: Illustrate algorithms for drawing basic primitives like Point, Line and Polygon. CO 2: Illustrate algorithms for performing 2D Geometric Transformations, viewing and clipping. CO 3: Illustrate algorithms for performing 3D Geometric Transformations, clipping. CO 4: Demonstrate plane Bezier curves and Bezier surfaces.				
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**

2DGeometric Transformations: Basics of translation, scaling and rotation. Matrix representations and homogeneous coordinates for translation, scaling and rotation. 2D Composite transformations, General pivot point rotation and scaling, OpenGL geometric transformations functions.

Basics of 2D viewing and Clipping: Basics of viewing and Clipping, 2D viewing pipeline, Viewing Transformation systems, Types of clipping: point, Line and polygon clipping, 2D line clipping algorithms: cohen-sutherland line clipping, Liang-Barsky line clipping algorithm, polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm, OpenGL 2D viewing and clipping functions.

Module 3	**3D Geometric Transformations, clipping:**	Assignment	**No. of Classes : 9**

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

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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
Recommended by the Board of Studies on	BOS NO: 13th BOS, held on 08/12/2021
Date of Approval by the Academic Council	Academic Council Meeting No. 17, Dated 11/12/2021

Course Code: **CSE2067**	**Course Title: Web Technology** **Type of Course: Program core** **Theory & Integrated Laboratory**	**L- P- C**	2	2	3
Version No.	1.0				
Course Pre-requisites	**NIL**				
Anti-requisites	**NIL**				
Course Description	The purpose of the course is to provide a comprehensive introduction to scripting languages that are used for creating web-based applications. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.				
Course Objective	**This course is designed to improve the learners' EMPLOYABILITY SKILLS by using EXPERIENTIAL LEARNING techniques.**				
Course Outcomes	**On successful completion of this course the students shall be able to:** **CO1:** Implement web-based application using client-side scripting languages. **(Application level)** **CO2**: Apply various constructs to enhance the appearance of a website. **(Application level)**				

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	CO3: Apply server-side scripting languages to develop a web page linked to a database. **(Application level)**			
Course Content:				
Module 1	**Introduction to XHTML**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications	**10 Classes**
Topics: Basics: Web, WWW, Web browsers, Web servers, Internet. XHTML: Origins and Evolution of HTML and XHTML: Basic Syntax, Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, Frames, Syntactic Differences between HTML and XHTML.				
Module 2	**Advanced CSS**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages	**12 Classes**
Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn. Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks **XML:** Basics, demonstration of applications using XML				
Module 3	**PHP – Application Level**	Quizzes and assignments	Application of PHP in web designing	**14 Classes**
Topics: **PHP:** Introduction to server-side Development with PHP, Arrays, and Superglobals, Arrays, $GET and $ POST, Super global Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object, Classes and Objects in PHP, Object Oriented Design, Working with Databases, SQL, Database APIs, Managing a MySQL Database. Accessing MySQL in PHP.				
List of Laboratory Tasks: **Experiment No. 1: Demonstration of XHTML features** Level 1: Demonstration of various XHTML Tags (Level 1) Level 2: Design and develop static web pages for an online Book store (Level 2). **Experiment No. 2: Application of CSS in web designing** Level 1: Design a document using XHTML and CSS to create a catalog of items for online electronic shopping.				

Level 2: Create and save XML document for students' information and display the same using cascaded style sheet.

Experiment No. 3: Application of PHP in web designing.

Level 1: Write a PHP program to read the personal information of a person such as first name, last name, age, permanent address, and pin code entered by the user into a table created in MySQL. Read the same information from the database and display it on the front end.

Level 2: Using PHP develop a web page that accepts book information such as ISBN number, title, authors, edition, and publisher and store information submitted through the web page in MySQL database.

Experiment No. 4: Building a website.

Build a website for organizing an International Conference. The conference website must be able to collect the author's details and upload a file.

Targeted Application & Tools that can be used:

Xampp web server to be used to demonstrate PHP.

Project work/Assignment:

Assignments are given after completion of each module which the student need to submit within the stipulated deadline.

Textbook(s):

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 prepared by	Dr. Shankar K. Ghosh, Jobin Thomas.
Recommended by the Board of Studies on	BOS NO: 12th BOS, held on 04/08/2021

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

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 – AdaBoost and Gradient Boosting; Grid Search for optimal parameters; Clustering algorithms; Forecasting with Time-Series data : Auto-Regressive Integrated Moving Average Models, Recommender Systems : Association Rule Mining, Collaborative Filtering, Text Analytics – Sentiment Classification using Naïve Bayesian model.				
Course Out Comes	On successful completion of this course the students shall be able to: 1] To develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents. (KNOWLEDGE) 2] Produce machine learning models for predictive analytics. (Application) 3] Apply ensemble learning, optimization and hyper parameter tuning techniques for machine learning algorithms. (Application) 4] Demonstrate different types of clustering techniques. (Application) 5] Employ time series forecasting techniques/models for real world problems. (Application)				
Course Content:					
Module 1	**Introduction to Artificial Intelligence and Knowledge based systems**	Assignment	Theory	**6Hours(6L)**	
Topics: Introduction to Artificial Intelligence, Definitions, foundation, History and Applications; Agents: Types of Agent, Structure of Intelligent agent and its functions, Agents and Environment; Introduction to Knowledge					

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representation, approaches and issues in knowledge representation, Knowledge-based agent and its Structure, Knowledge-Based Systems; Frame Structures, Conceptual graphs.

Module 2	**Supervised Machine Learning Algorithms**	Assignment	Programming activity	**16 Hours(8L,8P)**

Topics:
Introduction to the Machine Learning (ML) Framework, types of ML, types of variables/features used in ML algorithms, One-hot encoding, Simple Linear Regression, Multiple Linear Regression, Model Evaluation, Validation and Accuracy measures for Regression models. Classification models – Decision Tree algorithms using Entropy and Gini Index as measures of node impurity, model evaluation metrics for classification algorithms, **Cohen's Kappa Statistic, Multi-class classification and Class Imbalance problem. Naïve Bayes Classifiers and Naive Bayes model for sentiment classification – an introduction.**

Module 3	**Advanced Machine Learning Concepts**	Assignment	Programming activity	**14Hours(8L, 6P)**

Topics:
Nearest Neighbor techniques, Cost functions and Optimization Technique – introduction to Gradient Descent, its applications on Linear Regression. Ensemble Learning algorithms – Bagging (Random Forest), 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.

Module 4	**Clustering and Forecasting with Time-Series Data**	Assignment	Programming activity	**Hours(6**

Topics:
Partitioned Clustering – K-means and Hierarchical Clustering techniques, cluster validity measures, Components Time Series data, forecasting using moving average, exponential smoothing, calculating forecast accura decomposing time series data, auto-regressive integrated moving average models(ARIMA). Association Rule Mini 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.

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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

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 -1 1

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 **https://www.tutorialspoint.com/google_colab/index.html** 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 https://learn.datacamp.com/courses?topics=Machine%20Learning**
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.

Catalogue prepared by	Dr. Aditya K Saxena and Dr. Sandeep
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: CSE3082	**Course Title: Object Oriented Analysis and Design with UML** **Type of Course: Program Core and Theory**	**L- P- C**	3	0	3
Version No.	1.0				
Course Pre-requisites	CSE 1001 Java Programming				
Anti-requisites	**NIL**				

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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 designed to improve the learners " SKILL DEVELOPMENT "by using EXPERIENTIAL LEARNING techniques.			
Course Outcomes	On successful completion of the course the students shall be able to: 1]Describe the basics of object oriented system development **[Knowledge]** 2]Identify the various techniques for object-oriented analysis techniques [**Comprehension]** 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 system	Assignment	Identify problem domain objects for an application domain	**8 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 oriented analysis	Assignment	Identification of candidate classes using various approaches	**10 Classes**
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 to axiomatic design	Assignment	Apply axioms to create class diagram	**10 Classes**

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

Module 4	Object oriented Design process	Assignment	Apply the design process and develop a component and deployment diagram.	**10 Classes**

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 prepared by	Dr. Clara Kanmani A
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 3078**	**Course Title: Cryptography and Network Security** **Type of Course: Program Core & Theory only**	**L- P- C**	3	0	3
Version No.	1				
Course Pre-requisites	"Data Communications and Computer Networks".				
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 course is **SKILL DEVELOPMENT** of student by using **PARTICIPATIVE LEARNING** techniques.				

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<table>
<tr><td>Course Outcomes</td><td colspan="4">On successful completion of this course the students shall be able to:
CO1: Identifies the basic concept of Cryptography (Knowledge)
CO2: Express the different types of Cryptographic Algorithms. (Comprehension)
CO3: Recognize the Public key Cryptographic Techniques for various applications. (Comprehension)
CO4: Apply the network security concepts during their implementation of network security application developments. (Application)</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Introduction to Cryptography</td><td>Assignment</td><td>Identify the Concepts</td><td>08 Sessions</td></tr>
<tr><td colspan="5">Topics:
Introduction to Cryptography, Model of Network Security, OSI Security architecture, Security Attacks: active attacks, passive attacks, services: Authentication, Access Control, Data Confidentiality, Data Integrity, Nonrepudiation, Substitution Ciphers : Caesar, Mono alphabetic, Polyalphabetic, Play-fair and Hill Cipher, Introduction to Block Cipher and Stream Cipher, Festal Structure.</td></tr>
<tr><td>Module 2</td><td>Private Key Cryptography and Number Theory</td><td>Assignment</td><td>Analysis of requirement of complexity in cryptography</td><td>13 Sessions</td></tr>
<tr><td colspan="5">Topics:
Symmetric Encryption Algorithms : Data Encryption Standard, Introduction to Galois Field, Advanced Encryption Standard, Modular Arithmetic, Prime numbers, Fermat’s little theorem, brief about primality testing and factorization, Discrete Logarithmic Problem, Euclidean and Extended Euclidean Algorithm, Euler Totient Function, Chinese Remainder Theorem</td></tr>
<tr><td>Module 3</td><td>Public Key Cryptography and its Applications</td><td>Assignment</td><td>Recognize the importance of various security concepts to achieve sufficient solutions</td><td>10 Sessions</td></tr>
<tr><td colspan="5">Topics:
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.</td></tr>
<tr><td>Module 4</td><td>Network Security</td><td>Assignment</td><td>Implement the advanced network security algorithms in recent applications.</td><td>07 Sessions</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td colspan="5">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.</td></tr>
</table>

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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.https://onlinecourses.nptel.ac.in/noc22_cs90/preview

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 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

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Course Code: ECE2007	Course Title: Digital Design Type of Course: Program Core Theory & Integrated Laboratory	L- P- C	2	2	3
Version No.	1.0				
Course Pre-requisites	Basic concepts of number representation, Boolean Algebra, Arithmetic and Logic Computation.				
Anti-requisites	**NIL**				
Course Description	**The purpose of this course is to enable the students to appreciate the fundamentals of digital logic circuits and Boolean algebra focusing on both combinational and sequential logic circuits. The course emphasizes on minimization techniques for making canonical and low-cost digital circuit implementations. This course deals with analysis and design of digital electronic circuits. The course also creates a foundation for future courses which includes Computer Architecture, Microprocessors, Microcontrollers, and Embedded Systems etc.** The course enhances the Design, Implementation and Programming abilities through laboratory tasks. The associated laboratory provides an opportunity to verify the theoretical knowledge.				
Course Objective	**The objective of the course is SKILL DEVELOPMENT of the student by using PARTICIPATIVE LEARNING techniques.**				
Course Outcomes	**On successful completion of this course the students shall be able to:** i. **Discuss** the concepts of number systems, Boolean algebra and logic gates. ii. **Apply** minimization techniques to simplify Boolean expressions. iii. **Demonstrate** the Combinational circuits for a given logic iv. **Illustrate** the Sequential and programmable logic circuits v. **Implement** various combinational logic circuits using gates. vi. **Verify** the performance of various sequential logic circuits using gates.				
Course Content:					
Module 1	**Fundamentals of Number systems- Boolean algebra and digital logic**	Application Assignment	Data Analysis task		**6 Session**
Topics: Review of Number systems, Number base conversions, complements of numbers, Binary Codes, Boolean theorems and Boolean algebra, Boolean functions- canonical and standard forms, Digital logic gates, Introduction, two, three, four variable K-Maps, utilizing Don't care conditions. Quine McClusky Method for simplification. Universal Gates (NAND & NOR) Implementations.					
Module 2	**Combinational Logic circuits:**	Application Assignment	Programming Task & Data Analysis task		**10 Session**
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.					

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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 flops
Level 1: Verify the operation of SR and D Flip-Flops on Digital Logic Trainer kit
Level 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 kit
Level 2: Construct and verify a T Flip-Flop using JK Flip-Flop.

Experiment No. 8: Construct and verify the sequential logic circuit for given specifications
Level 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 circuits
Level 1: Gate level Modeling
Level 2: Behavioral Modeling

Experiment No. 10: Write the HDL coding for basic sequential logic circuit
Level 1: Gate level Modeling
Level 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. Presidency University Library Link .

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.

Reference(s):

Reference Book(s):

R1. Jain, R. P., *"Modern Digital Electronics",* McGraw Hill Education (India), 4th Edition

R2. Roth, Charles H., Jr and Kinney Larry L., *"Fundamentals of logic Design"*, Cengage Learning, 7th Edition

Online Resources (e-books, notes, ppts, video lectures etc.): Book Free Download (studymaterialz.in)

1. **eBook1**: Mano, M. Morris and Ciletti Michael D., *"Digital Design"*, Pearson Education.
2. {[PDF] Digital Design By M. Morris Mano, Michael D Ciletti Book Free Download }
3. **eBook2:**Floyd "DIGITAL LOGIC DESIGN" fourth edition- ePub, eBook- [PDF] DIGITAL LOGIC DESIGN FOURTH EDITION FLOYD | abri.engenderhealth.org.
4. NPTEL Course- NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits
5. Digital Logic Design PPT Slide 1 (iare.ac.in)
6. Lab Tutorial: Multisim Tutorial for Digital Circuits - Bing video
   CircuitVerse - Digital Circuit Simulator online
   Learn Logisim ➡ Beginners Tutorial | Easy Explanation! - Bing video
   Digital Design 5: LOGISIM Tutorial & Demo

E-content:

1. Z. Xin-Li and W. Hong-Ying, "The Application of Digital Electronics in Networking Communication," 2016 Eighth International Conference on Measuring Technology and Mechatronics Automation (ICMTMA), 2016, pp. 684-687, doi: 10.1109/ICMTMA.2016.168.
2. An encoding technique for design and optimization of combinational logic circuit Dipayan Bhadra;Tanvir Ahmed Tarique;Sultan Uddin Ahmed;Md. Shahjahan;Kazuyuki Murase 2010 13th International Conference on Computer and Information Technology (ICCIT)
3. A. Matrosova and V. Provkin, "Applying Incompletely Specified Boolean Functions for Patch Circuit Generation," 2021 IEEE East-West Design & Test Symposium (EWDTS), 2021, pp. 1-4, doi: 10.1109/EWDTS52692.2021.9581029.

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Topics related to development of "FOUNDATION SKILLS": Adders, Multiplexers, Decoders / Encoders, Flip-Flops, Counters and Registers.

Catalogue prepared by	**Dr. G. Muthupandi**
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.

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PRESIDENCY UNIVERSITY Registrar BANGALORE

Course Code: CSE2020	Course Title: Blockchain Technology and Applications Type of Course: Program Core	L-P-C	3	0	3
Version No.	1.0				
Course Pre-requisites	Fundamentals of Blockchain Technology				
Anti-requisites	NIL				
Course Description	The purpose of the course is to provide an introduction to Blockchain technology with specific focus on industrial applications like Blockchain in Financial system, trade/supply chain management, agriculture industry, Healthcare sectors and Insurance system. With the knowledge of blockchain technology, Students will learn how these system are built, how to interact with them.				
Course Objectives	This course is designed to improve the learners employability skills by using experiential learning techniques				
Course OutComes	On successful completion of this course the students shall be able to: 1. Understand the concepts of Blockchain technology (Knowledge). 2. Explain the methods for verification and validation of Bitcoin transactions (Comprehension). 3. Explore the use the Ethereum programming (Application). 4. Illustrate the role of blockchain in various domain (Comprehension).				
Course Content:					

Module 1	Introduction to Blockchain	Quiz	Knowledge based quiz on Cryptographic Hash Functions	No. of Classes:8
Topics: Incentives and proof of work. Simple Local Storage, Hot and Cold Storage, Online Wallets and Exchanges, Payment Services, Transaction Fees, Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures.				
Module 2	Bitcoin	Assignment	Bitcoin mining pools	No. of Classes:10
Bitcoin Mechanics: Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bitcoin network, Limitations and improvements. Bitcoin mining: The task of Bitcoin miners, Mining Hardware, Energy consumption, Mining pools, Mining incentives and strategies.				
Module 3	Ethereum	Create a smart contract using solidity language	Components of Ethereum Ecosystem	No. of Classes:10
The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols – Solidity Language.				
Module 4	Blockchains in Business	Case Study	Conduct a case study on how BaaS is adopted in industries.	No. of Classes:10
Topics: Blockchain in Supply Chain - Blockchain in Manufacturing - Blockchain in Automobiles - Blockchain in Healthcare- Blockchain in Financial Industry				
List of Laboratory Tasks: NA				

Targeted Application & Tools that can be used:

- Etherum Remix online & Ganache
- Solidity programming language

Project work/Assignment:

1. Calculate the 'number of ethers' for the transaction of gas limit for the scenario in which the sender sets the gas limit to 50,000 and a gas price to 20 gwei.
2. Represent the Ethereum Merkley Tree for the given list of Transactions.
3. Create Survey report of various types of Blockchain and its real time use cases.

Textbook(s):

1. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, "Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited, 2018.

References:

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained", 2nd Edition, Packt Publishing Ltd, March 2018.

Weblinks:

- Udemy: https://www.udemy.com/course/build-your-blockchain-az/
- NPTEL online course : https://nptel.ac.in/courses/106/104/106104220/#

Textbook(s):

1. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, "Blockchain By Example: A developer's guide to creating decentralized 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 by the Academic Council	Academic Council Meeting No. 8, Dated 03/08/22

REGISTRAR

PRESIDENCY UNIVERSITY Registrar BANGALORE

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				
Course Pre-requisites	CSE2074-DBMS				
Anti-requisites	NIL				
Course Description	Introduction to non-relational (NoSQL) data models, such as Key-Value, Document, Column, Graph and Object-Oriented database models. Advantages and disadvantages of the different data architecture patterns will be discussed. Hands-on experience with a representative sample of open-source NoSQL databases will be provided. The rapid and efficient processing of data sets with a focus on performance, reliability, and agility will be covered.				
Course Objectives	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: 1. **Understand** history, fundamentals, characteristics, and main benefits of NoSQL databases. [Knowledge] 2. **Comprehend** different types of NoSQL databases through case studies. [Comprehension] 3. **Design** different types of NoSQL databases, add content, and try queries on them. [Comprehension]				
Course Content:					
Module 1	NoSQL Database Architectures	Assignment	Knowledge	No. of Classes:6	
Topics: Transactions: Concurrency and Integration, ACID, NoSQL emergence and its main features, BASE for reliable database transactions, Achieving horizontal scalability with data base sharding, Brewers CAP theorem. Main Data models of NoSQL: Document Data Model, Key-Value Data Model, Columnar Data Model, Graph Data Model.					
Module 2	Document data model	Assignment	Analysis	No. of Classes: 6	
Topics: Characteristics of Document Data Model, Collection, Naming, CRUD Operation, Querying, Indexing, Replication, Sharding, Consistency, Update Consistency, Read Consistency, Relaxing Consistency, Capped Collection.					
Module 3	Document Data Model Hands on: Mongo DB / Casandra	Assignment	Programming (Embedded Lab)	No. of Classes:7	
Topics: Install, Perform CRUD (create, read, update and delete) Operations, Aggregations, Data Models, Transactions, Indexes, Security, Replication and Sharding.					
Module 4	**Basics of Columnar and Graph Data Models**	Assignment	Comprehend	No. of Classes: 7	
Topics: Columnar Data Model: Comparison of columnar and row-oriented storage, Column-store Architectures: C-Store and Vector-Wise, Column-store internals and, Inserts/updates/deletes, Indexing, Adaptive Indexing and Database Cracking.					

Graph Data Model: Comparison of Relational and Graph Modeling, Property Graph Model Graph Analytics: Link analysis algorithm- Web as a graph, Page Rank-Markov chain, page rank computation, Topic specific page rank (Page Ranking Computation techniques: iterative processing, Random walk distribution.

Learn MongoDB/Casandra by doing the following

- Master the art of queries, CRUD, schema design, and data aggregation
- Understand scalability using sharding and replication
- Write code, build real-world projects and learn hands-on with Cloud Labs

List of Lab Experiments

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:

1. 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.
2. 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

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition, 2019

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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

2. 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
https://www.perlego.com/book/2059687/mongodb-fundamentals-a-handson-guide-to-using-mongodb-and-atlas-in-the-real-world-pdf

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				

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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 learning Kerberos configuration for Hadoop ecosystem components – Pig, Hive, Oozie, Flume.			
Course Outcomes	On successful completion of this course the students shall be able to: 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]			
Course Content:				
Module 1	Big Data Privacy, Ethics And Security	Assignment/Quiz	Big data security-organizational security	08 classes
Topics: Privacy – Reidentification of Anonymous People – Why Big Data Privacy is self regulating? – Ethics – Ownership – Ethical Guidelines – Big Data Security – Organizational Security. Assignment: Big data security-organizational security				
Module 2	Security, Compliance, Auditing, And Protection	Assignment	communication protocols for each of the Hadoop ecosystem components	08 classes
Topics: Steps to secure big data – Classifying Data – Protecting – Big Data Compliance – Intellectual Property Challenge – Research Questions in Cloud Security – Open Problems. Assignment: communication protocols for each of the Hadoop ecosystem components				
Module 3	Hadoop Security Design, Hadoop Ecosystem Security	Case study	Kerberos configuration for ecosystem tools	08 classes
Topics: Kerberos – Default Hadoop Model without security - Hadoop Kerberos Security Implementation & Configuration. Configuring Kerberos for Hadoop ecosystem components – Pig, Hive, Oozie, Flume, HBase, Sqoop. Assignment: Kerberos configuration for Hadoop ecosystem tools				
Module 4	Data Security & Event Logging	Case study	Event monitoring in Hadoop cluster	08 classes

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Topics:

Integrating Hadoop with Enterprise Security Systems - Securing Sensitive Data in Hadoop – SIEM system – Setting up audit logging in hadoop cluster

Assignment: Event monitoring in Hadoop cluster

Assignment:

1. Book/Article review: At the end of each module a book reference or an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format. Presidency University Library Link .

2. Presentation: 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.

Text Book(s):

1. Sudeesh Narayanan, "Securing Hadoop", Packt Publishing, 2013.
2. Ben Spivey, Joey Echeverria, "Hadoop Security Protecting Your Big Data Problem", O'Reilly Media, 2015.

Reference(s):

Reference Book(s):

1. Mark Van Rijmenam, "Think Bigger: Developing a Successful Big Data Strategy for Your Business", Amazon, 1 edition, 2014.
2. Frank Ohlhorst John Wiley & Sons, "Big Data Analytics: Turning Big Data into Big Money", John Wiley & Sons, 2013.
3. Sherif Sakr, "Large Scale and Big Data: Processing and Management", CRC Press, 2014.

Online Resources (e-books, notes, ppts, video lectures etc.):

1. Top Tips for Securing Big Data Environments: e-book (http://www.ibmbigdatahub.com/whitepaper/top-tips-securing-big-data-environments-ebook)
2. http://www.dataguise.com/?q=securing-hadoop-discovering-and-securing-sensitive-datahadoop-data-stores
3. Gazzang for Hadoop http://www.cloudera.com/content/cloudera/en/solutions/enterprisesolutions/security-for-hadoop.html
4. eCryptfs for Hadoop https://launchpad.net/ecryptfs.
5. Project Rhino - https://github.com/intel-hadoop/project-rhino .

Weblinks:

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehost-live&ebv=EB&ppid=pp_xiii

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live

Topics related to development of "FOUNDATION": Steps to secure big data ,Classifying Data

Topics related to development of "EMPLOYABILITY": Configuring Kerberos for Hadoop ecosystem components – Pig, Hive, Oozie, Flume

Catalogue prepared by	Ms Pavithra.N ,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: CSE2022	**Course Title:** Domain Specific Predictive Analytics **Type of Course: Program Core and Theory only**	**L- P- C**	3	0	3
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:					

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Module 1	Retail Analytics	Assignment	Programming/Data analysis task	**8 Sessions**

Topics:

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.

Module 2	Risk Analytics	Assignment	Programming/Data analysis task	**8 Sessions**

Topics:

Risk Management and Operational Hedging: An Overview, Supply Chain Risk Management, A Bayesian Framework for Supply Chain Risk Management, Credit Scoring and Bankruptcy Prediction.

Assignment: To apply appropriate Machine learning algorithms to understand Bankruptcy Prediction.

Module 3	Financial Data Analytics	Assignment	Data analysis	**10 Sessions**

Financial News analytics: Framework, techniques, and metrics, News events impact market sentiment, Relating news analytics to stock returns, Financial Time Series and Their Characteristics, Common Financial Time Series models.

Assignment: To under various Markov chain models.

Module 4	Healthcare Data Analytics	Assignment	Data analysis	**10 Sessions**

Introduction to Healthcare Data Analytics, Electronic Health Records, Privacy-Preserving

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Data Publishing Methods in Healthcare, Clinical Decision Support Systems, Social Media Analytics for Healthcare: Tracking of Infectious Disease Outbreaks, Readmission risk Prediction. Natural Language Processing and Data Mining for Clinical Text: Core NLP Components, Information, Extraction and Named Entity Recognition, Social Media Analytics for Healthcare: Tracking of Infectious Disease Outbreaks, Readmission risk Prediction.	
Targeted Application & Tools that can be used: • **Business Analytical Applications** • **Social media Data Analysis** • **Predictive Analytics** **Tools: Hadoop Framework tools like map reduce, Hive, Hbase, Scoop, Spark.**	
Project work/Assignment:	
Quiz/ Seminars/Assignment	
Text Book Olivia Parr Rud "Data Mining Cookbook: Modeling Data for Marketing, Risk, and Customer Relationship Management", Wiley, 2016. Chandan K. Reddy, Charu C. Aggarwal "Healthcare Data Analytics", CRC Press, 2015.	
References 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 Intelligence and Analytics **Type of Course:** Integrated	**L- P- C**	2	2	3
Version No.	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.				

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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:** 1. A grounded understanding of web intelligence and business analytics terminology related to the above. 2. How to deploy web intelligence to improve the outcomes of your marketing or business plan. 3. How Analysts impact the bottom line (their role) within various businesses and lines of business 4. Growth potentials for Web Analysts and Big Data professionals •			
Course Content:				
Module 1	INTRODUCTION TO INTELLIGENT WEB	Assignment	Data Collection/Interpretation	**6 Sessions**
INTRODUCTION TO INTELLIGENT WEB -Inside the search engine - Examples of intelligent web applications - Basic elements of intelligent applications - Machine learning, data mining – Searching, Reading, indexing, and searching.				
Module 2	LISTEN AND LOAD	Case studies / Case let	Case studies / Case let	**6 Sessions**
LISTEN AND LOAD- Streams, Information and Language, - Statistics of Text - Analyzing Sentiment and Intent – Load - Databases and their Evolution, Big data Technology and Trends.				
Module 3	CLUSTERING AND CLASSIFICATION	Quiz	Case studies / Case let	**9 Sessions**
CLUSTERING AND CLASSIFICATION An overview of clustering algorithms - Clustering issues in very large datasets - The need for classification - Automatic categorization of emails and spam filtering - Classification with very large datasets - Comparing multiple classifiers on the same data.				
Module4- REASONING (4 hours) Reasoning: Logic and its Limits, Dealing with Uncertainty - Mechanical Logic - The Semantic Web - Limits of Logic - Description and Resolution - Collective Reasoning. Module-5 PREDICTING (6 hours) Statistical Forecasting - Neural Networks - Predictive Analytics - Sparse Memories - Sequence Memory - Network Science – Data Analysis: Regression and Feature Selection - Case Study - set of retrieved and processed news stories.				
List of Laboratory Tasks: **Laboratory Work:** to analyzing the web for various functionalities given in the subject and using various tools and technologies to do the experimentation. It also involves installation and working on tools and technologies in this domain.				

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Targeted Application & Tools that can be used	
Project work/Assignment:	
Assignment:	
Text Book 1. Gautam Shroff, "Intelligent Web - Search, Smart Algorithms, and Big Data", Oxford University Press, 2016. 2. Haralambos Marmanis, Dmitry Babenko, "Algorithms of the Intelligent Web", Manning publications, 2019.	
References 1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, "An Introduction to Information Retrieval", Cambridge University Press, 2019. 2. Mark Gardener, "Beginning R - The Statistical Pr ogramming Language", John Wiley & Sons, Inc., 2012. 3. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013. R3 **Web resources:** tp://www.coursetalk.com/coursera/web-intelligence-and-big-data Course code Course Title L T	
Topics relevant to development of "Skill Development": **Topics relevant to development of "Environment and sustainability**	
Catalogue prepared by	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: CSE3032	**Course Title:** Streaming Data Analytics **Type of Course: Program Core** **Theory and Lab Integrated Course**	**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.				

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Course Objectives	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.			
Course Outcomes	On successful completion of the course the students shall be able to: • **Recognize** the characteristics of data streams that make it useful to solve real-world problems. • **Identify and apply** appropriate algorithms for analyzing the data streams for a variety of problems. • **Implement** different algorithms for analyzing the data streams.			
Course Content:				
Module 1	Introduction to Data Streams	Programming Assignment	Streaming methods	**8 Classes**
Introduction to Data Streams: Data Stream Models, Research Issues in Data Streams Management Systems, Knowledge Discovery from Data Streams, Basic Streaming Methods: Counting the Number of Occurrence of the Elements in a Stream, Counting the Number of Distinct Values in a Stream, Bounds of Random Variables, Poisson Processes, Sliding Windows.				
Module 2	Decision Trees and Clustering from Data Streams	Programming Assignment	Streaming Data Collection and Analysis	**10 Classes**
Decision Trees and Clustering from Data Streams: Introduction, The Very Fast Decision Tree Algorithm, Extensions to the Basic Algorithm: Processing Continuous Attributes, Functional Tree Leaves, Clustering Examples: Partitioning Clustering, Hierarchical Clustering, Micro Clustering, Grid Clustering .				
Module 3	Frequent Pattern Mining	Programming Assignment	Streaming Data analysis	**8 Classes**
Frequent Pattern Mining: Introduction to Frequent Itemset Mining: The FP-growth Algorithm, Summarizing Itemsets, Heavy Hitters, Mining Frequent Itemsets from Data Streams: Landmark				

Windows, Mining Recent Frequent Itemsets, Frequent Itemsets at Multiple Time Granularities, Sequence Pattern Mining

Module4 7 classes

Evaluating Streaming Algorithms Evaluation Issues, Design of Evaluation Experiments, Evaluation Metrics, Error Estimators using a Single Algorithm and a Single Dataset, Comparative Assessment, The 0-1 loss function, Evaluation Methodology in Non-Stationary Environments, The Page-Hinkley Algorithm

List of Laboratory Tasks:

1. **Level 1:** Exploring stream processing engine STORM
   Level 2: Exploring stream processing engine STREAM

2. Implementation of decision tree algorithms
   Level 1: Implementation of VFDT decision tree algorithm
   Level 2: Implementation of CVFDT decision tree algorithm

3. Implementation of partitioning clustering on stream.
   Level 1: Implementation of partitioning clustering The Leader Algorithm.
   Level 2: Implementation of Single Pass k-Means partitioning Clustering Algorithm.

4. Implementation of micro clustering on stream.
   Level 1: Implementation of Fractal Clustering algorithm Initialization phase
   Level 2: Implementation of Fractal Clustering algorithm Incremental phase

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**

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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)

Course Code: **CSE3150**	**Course Title:** **Front-end Full Stack Development**	**L- P- C**	2	2	3
Version No.	1.0				
Course Pre-requisites	**Nil**				
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 designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.				

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<table>
<tr><td>Course Outcomes</td><td colspan="4">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]</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Fundamentals of DevOps and Web Development</td><td>Project</td><td>Programming</td><td>04 Sessions</td></tr>
<tr><td colspan="5">Topics:
Introduction to Agile Methodology; Scrum Fundamentals; Scrum Roles, Artifacts and Rituals; DevOps – Architecture, Lifecycle, Workflow & Principles; DevOps Tools Overview – Jenkins, Docker, Kubernetes.
Review of GIT source control. HTML5 – Syntax, Attributes, Events, Web Forms 2.0, Web Storage, Canvas, Web Sockets; CSS3 – Colors, Gradients, Text, Transform
Assignment: Develop a website for managing HR policies of a department.</td></tr>
<tr><td>Module 2</td><td>Responsive web design</td><td>Project</td><td>Programming</td><td>03 Sessions</td></tr>
<tr><td colspan="5">Topics:
BootStrap for Responsive Web Design; JavaScript – Core syntax, HTML DOM, objects, classes, Async; Ajax and jQuery Introduction
Assignment: Design and develop a website that can actively keep track of entry-exit information of a housing society.</td></tr>
<tr><td>Module 3</td><td>Fundamentals of Angular.js</td><td>Project</td><td>Programming</td><td>08 Sessions</td></tr>
<tr><td colspan="5">Topics:
Setting up Development & Build Environment: Node.js and NPM; Introduction to TypeScript; Working with OOP concepts with TypeScript; Angular Fundamentals; Angular CLI; Introduction to TypeScript; Debugging Angular applications; Components & Databinding in Depth; Angular Directives; Using Services & Dependency Injection; Angular Routing; Observables; Handling Forms in Angular Apps; Output transformation using Pipes; Making Http Requests; Authentication & Route Protection; Dynamic Components; Angular Modules & Optimizing Angular Apps; Deploying an Angular App; Angular Animations; Adding Offline Capabilities with Service Workers; Unit Testing in Angular Apps (Jasmine, Karma).
Assignment: Develop a software tool to do inventory management in a warehouse.</td></tr>
<tr><td>Module 4</td><td>Fundamentals of React.js</td><td>Project</td><td>Programming</td><td>15 Sessions</td></tr>
<tr><td colspan="5">Topics:
Overview of React.js.; Reactive Programming; React Components; Render Method; Virtual DOM and Bandwidth Salvation; Two Distinct Ways of Initializing a React Class; States & Life Cycles; Component Mounting; Node.js & NPM; JSX Walkthrough; React Testing.
Assignment: Develop a web-based application to book movies/events (like bookmyshow).</td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:</td></tr>
</table>

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Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers. **Professionally Used Software: GCC compiler.**
Project work/Assignment:
1. **Problem Solving: Design of Algorithms and implementation of programs.** 2. **Programming: Implementation of given scenario using Java.**
Text Book: T1. Fender, Young, "*Front-end Fundamentals",* Leanpub, 2015 T2. Northwood, Chris, "*The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer",* APress, 2018
References: R1. Flanagan D S, *"Javascript : The Definitive Guide"* 7th Edition. 7th ed. O'Reilly Media; 2020. R2. Alex Libby, Gaurav Gupta, and Asoj Talesra. *"Responsive Web Design with HTML5 and CSS3 Essentials",* Packt Publishing, 2016 R3. Duckett J Ruppert G Moore J. *"Javascript & Jquery : Interactive Front-End Web Development.";* Wiley; 2014. R4. Greg Sidelnikov, *"React.js Book_ Learning React JavaScript Library"*, 1 edition, Scratch-River Tigris LLC 2016 R5. Web Reference: https://www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhxo_jxlY_uTWA&index=2

Catalogue prepared by	Dr. Jayakumar V, Dr. M Chandrashekhar, Dr. Murali Parameswaran
Recommended by the Board of Studies on	(BOS NO: SOCSE1. 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: **CSE3151**	**Course Title:** **Java Full Stack Development**	**L- P- C**	2	2	3
Version No.	1.0				
Course Pre-requisites	**Nil**				
Anti-requisites	**CSE3152 .NET Full Stack Development**				
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				

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	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 designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.			
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; Advanced concepts of Java; Java generics; Java IO; New Features of Java. Unit Testing tools.				
Module 2	Java EE Web Applications	Project	Programming	**05 Sessions**
Topics: Introduction to Eclipse & Tomcat; JSP Fundamentals; Reading HTML form Data with JSP; State Management with JSP; JSP Standard Tag Library - Core & Function Tags; Servlet API Fundamentals; ServletContext, Session, Cookies; Request Redirection Techniques; Building MVC App with Servlets & JSP; Complete App - Integrating JDBC with MVC App **Assignment:** Develop an application for managing HR policies of a department.				
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	Project	Programming	**10 Sessions**
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

Topics:
Introduction to Automation Tools; Apache Maven: Maven Fundamentals, Software Setup - Commandline and Eclipse, pom.xml and Directory Structure, Multi-Module Project Creation, Scopes, Dependency Management, Profiles; Functional/BDD Testing using Selenium, Selenium Fundamentals and IDE, Selenium WebDriver, Installation and Configuration, Locating WebElements, Driver Commands, WebElement Commands
Assignment: Illustrate the use of automation tools in the development of a small software project.

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: Eclipse, NetBeans, Hibernate, Selenium, Maven, GIT.

Project work/Assignment:

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

Text Book:
T1. Fender, Young, "*Front-end Fundamentals",* Leanpub, 2015

References
R1. Soni, Ravi Kant. *"Full Stack AngularJS for Java Developers: Build a Full-Featured Web Application from Scratch Using AngularJS with Spring RESTful."* , Apress, 2017.
R2. Mardan, Azat. *"Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB."*, Apress, 2015

Catalogue prepared by	Mr. Sunil Sahoo, Dr. M Chandrashekhar, Dr. Murali Parameswaran
Recommended by the Board of Studies on	(BOS NO: SOCSE1. 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: CSE3152	Course Title: .NET Full Stack Development	L- P- C	2	2	3
Version No.	1.0				
Course Pre-requisites	**Nil**				
Anti-requisites	**CSE3151 Java Full Stack Development**				

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Course Description	This advanced level course enables students to perform full stack 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 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 designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.			
Course Outcomes	**On successful completion of the course the students shall be able to:** **1] Practice the use of C# for developing a small application [Application]** **2] Show web applications using Entity Framework. [Application]** **3]Solve simple web applications that use SQL and ASP.NET [Application]** **4] Apply concepts of ASP.NET to develop a Full Stack application. [Application]**			
Course Content:				
Module 1	C# Programming for Full Stack Development	Project	Programming	**10 Sessions**
Topics: .NET Framework Fundamentals, Visual Studio IDE Fundamentals, C# Language Features, Working with arrays and collections, Working with variables, operators, and expressions, Decision and iteration statements, Managing program flow and events, Working with classes and methods, OOP concepts, Properties, Auto Implemented, Delegates, Anonymous Methods and Anonymous Types, Extension methods, Sealed Classes/Methods, Partial Classes/Methods, Asynchronous programming and threading, Data validation and working with data collections including LINQ, Handling errors and exceptions, Working with Files, Unit Testing – Nunit framework **Assignment:** Develop a small application for managing library using C#.				
Module 2	Entity Framework Core 2.0	Project	Programming	**06 Sessions**
Topics: Entity Framework Core 2.0 Code First Approach; Introduction To Entity Framework and EDM; Querying the EDM; Working With Stored Procedures; Advanced Entity Framework - DbContext [EF6]; Advanced Operations; Performance Optimization; Data Access with ADO.NET **Assignment:** Develop an application for managing HR policies of a department.				
Module 3	ASP.NET	Project	Programming	**06 Sessions**
Topics: ASP.NET Core, ASP.Net Core 3.1 MVC, ASP.NET Core Middleware and Request pipeline, Review of SQL using MS SQL, Working With Data In Asp.Net, Razor View Engine, State Management In Asp. Net MVC & Layouts;				

Assignment: Develop a web application to mark entry/exit of guests in a building.				
Module 4	ASP.NET	Project	Programming	**08 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.				
Catalogue prepared by	Dr. Komalavalli C, Dr. Jayakumar V, Dr. Murali Parameswaran			
Recommended by the Board of Studies on	(BOS NO: SOCSE1. BOS held on 22 / 12 / 2022)			
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