DPU

Dr. D. Y. PATIL VIDYAPEETH, PUNE

(Deemed to be University)

Syllabus for B. Tech. Computer Science and Design

(2023-24)

First & Second Year

INDEX

REGULATION FOR THE UNDERGRADUATE DEGREE PROGRAMB. TECH. COMPUTER SCIENCE AND DESIGN BTCSD (2023-24)

1. **Eligibility**

- The Candidate should be an Indian National
- Passed 10+2 examination with Physics/ Mathematics / Chemistry/ Computer Science/ Electronics/ Information Technology/ Biology/ Informatics Practices/ Biotechnology/ Technical Vocational subject/ Agriculture/ Engineering Graphics/ Business Studies/ Entrepreneurship as per table1.3(a) Agriculture stream (for Agriculture Engineering) Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the above subjects taken together.

- Good Scores in any one of the following entrance exams: All India Level B. Tech. Artificial Intelligence (AI) and Data Science DPU Engineering Entrance Exam (AIBTAIET) or JEE (Main) or Any State Government Engineering Entrance Examination.

2. **Provision of Lateral Entry**
   Passed min. 3 years Diploma examination with at least 50% marks (45% marks in case of candidates belonging to reserved category subject to vacancies in the First Year, in case the vacancies at lateral entry are exhausted.
   (The Universities will offer suitable bridge courses such as Mathematics, Physics, Engineering drawing, etc., for the students coming from diverse backgrounds to prepare Level playing field and desired learning outcomes of the programme).

3. **Duration of the course**
   The B. Tech undergraduate degree program is of four years (Total Eight semesters) degree program.
   Duration of the course: 4 years i.e. 8 semesters.
   Semesters - An academic year consists of two semesters
   Odd Semester: June/July to November/December
   Even Semester: November/December to April/May

4. **Medium of instruction:**
   English shall be the medium of instruction for all the subjects of study and for examination of the course.

5. Attendance:
A candidate has to secure minimum-
1. 75% attendance in theory
2.80% in practical for qualifying to appear for the final examination.

6. Scheme of Examination

(a) Internal Examinations (Theory + Practical + Project)

1. There shall be two internal examinations (also called internal assessment tests I and II) of one hour duration for each course to be held as per the schedule fixed in the Academic Calendar.
2. A student can take for supplementary re-internal exam of a specific subject or all the subjects for the betterment of performance in case of scoring of less mark in previous internal assessment exams only after successful submission of an application to the class teacher which will be approved by Director/Principal of the institute.
3. A student has to do Project Based Learnings from the first year of their engineering, at the end of the degree program i.e. to the final year of engineering student has to perform the real life problem statement project in a group of 3 to 5 students.

b). University Examination

University Theory Examination Pattern		
Section A		
MCQs	15 x 1 Mark each	15 Marks
Section B		
Short Questions (Any 5 out of 8)	05 x 3 Marks each	15 Marks
Long answer Questions(Any 2 out 3)	02 * 5 Marks each	10 Marks
Section C		
Long answer Questions (Any 2out of 3)	02 x 10 Marks each	20 Marks
	Total	**60 Marks**

(c) EVALUATION SCHEME (THEORY)

Examination Duration Marks

I Internal 45 minutes 20

II Internal 30 minutes 15

Attendance 5

End Semester 2 hours 30 minutes 60

Total 100

PRACTICAL EVALUATION SCHEME

Examination Marks

Practical Internal (Continuous) assessment: 40

End semester examination: 60

Total: 100

(d) Standard of Passing:

1. The standard of passing shall be minimum 50% in each subject.
2. The marks of all heads combined (University Theory Exam + Internal Assessment Theory + Practical / Viva) shall be considered together for Passing of the candidate.

(e) Grace Marks

The grace marks up to a maximum of 1 percentage of total marks may be awarded to a student who has failed in not more than two subjects in the respective semester. Provided that these grace marks shall be awarded onlyif the student passes after awarding these marks.

(f) Grading System

UGC 10-point Grading Scale

Marks	Letter Grade	Grade Point
90 To 100	**O** : Outstanding	10
80 To 89	**A+** : Excellent	9
70 To 79	**A** : Very Good	8
60 To 69	**B+** : Good	7
55 To 59	**B** : Average	6
50 To 54	**P** : Pass	5
00 To 49	**F** : Fail	0
-	**AB** : Absent	0

Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The SGPA is the ratio of sum of the product of the number of credits withthe grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e. SGPA (Si) = Σ(Ci x Gi) / ΣCi where Ci is the number of credits of the course and Gi is the grade point scored by the student in the course.

ii. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme,i.e. CGPA = Σ(Ci x Si) / Σ Ci where Si is the SGPA of the semester and Ci isthe total number of credits in that semester.

iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Illustration of Computation of SGPA and CGPA and Format for Transcripts

i. Computation of SGPA and CGPA

Illustration for SGPA

Course	Credit	Grade letter	Grade point	Credit Point (Credit x Grade
Course 1	**3**	**A**	8	3 X 8 = 24
Course 2	**4**	B+	7	4 X 7 = 28
Course 3	**3**	B	6	3 X 6 = 18
Course 4	**3**	O	10	3 X 10 = 30
Course 5	**3**	C	5	3 X 5 = 15
Course 6	**4**	B	6	4 X 6 = 24
	20			**139**

Thus, SGPA =139/20 =6.95

Illustration for CGPA

semester 1	semester 2	semester 3	semester 4	semester 5	semester 6
credit : 20 sgpa : 6.9	credit : 22 sgpa : 7.8	credit : 25 sgpa : 5.6	credit : 26 sgpa : 6.0	credit : 26 sgpa : 6.3	credit : 25 sgpa : 8.0

Thus, CGPA = 20 x 6.9 + 22 x 7.8 + 25 x 5.6 + 26 x 6.0 + 26 x 6.3 + 25 x 8.0 = 6.73 144

ii. Transcript (Format): Based on the above recommendations on Letter grades, grade points and SGPA and CGPA, the Institute may issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

(g) ATKT (Allowed-to-keep-terms)

1. A Student who has failed in 3 subjects with 2 practical in respective academic year (Both Semesters combined) shall be allowed to keep term for next Semester respectively.

2. A student who failed more than 3 subjects in whole academic year cannot be promoted to next academic year.

3. For enrolment in third year of B. Tech Engineering program, a student must pass the university examinations of 1st & 2nd semesters of first year B. Tech , and a student from second year B. Tech Engineering program can be promoted to third year B. Tech Engineering program with not more than 3 subjects of second year B.Tech Engineering program (Both Semesters combined) as a backlog.

(i) Criteria for appointment of Examiner (Internal & External) andterms of their appointment.

1. Adhoc Board of Studies of Computer Science and Engineering shall submit, to the Committee constituted by Board of Examinations, a panel of examiner names, along with their addresses, suitable for appointment as Internal and External Examiners.

2. Examiners shall be appointed by the Academic Council as per section 8(b) (viii) of the Rules of Dr. D. Y. Patil University on the recommendations of the Board of Examinations.

3. In case of refusal from the person so appointed, the Controller of Examinations shall appoint substitute examiners from the panel approved.

4. Internal and External Examiners: An "Internal Examiner" means a person who is a teacher in the constituent college(s) / institute(s) of the University. The teachers in other universities or recognized teacher of other University in the state or outside the state shall be referred to as the "External Examiner".

5. Intimation of appointment as the examiner shall be accompanied by a copy of the instructions/guidelines relating to the examination for he/she is appointed, as also the information regarding the remuneration he/she shall be entitled to draw, if he/she acts as examiner. He/ She is expected to attend to and shall be required to send to the Controller of Examinations.

6. Examiners shall be appointed for examinations to be held in that academic year; however they shall be eligible for reappointment.

7. Relatives, Close Friends or next to the kin which are directly or indirectly related to the candidates shall not to be included.

7. Eligibility Criteria for appearing the Entrance Test

a) The candidate should be an Indian National.
b) Minimum age: 17 years on or before 31st December 2023
c) The candidate must have either appeared at Higher Secondary Certificate (HSC / Std. XII) examination

OR

Passed 10+2 examination with Physics/ Mathematics / Chemistry/ Computer Science/ Electronics/ Information Technology/ Biology/ Informatics Practices/ Biotechnology/ Technical Vocational subject/ Agriculture/ Engineering Graphics/ Business Studies/ Entrepreneurship as per table1.3(a) Agriculture stream (for Agriculture Engineering) Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the above subjects taken together

OR

Passed min. 3 years Diploma examination with at least 50% marks (45% marks in case of candidates belonging to reserved category subject to vacancies in the First Year, in case the vacancies at lateral entry are exhausted.(The Universities will offer suitable bridge courses such as Mathematics, Physics, Engineering drawing, etc., for the students coming from diverse backgrounds to prepare Level playing field and desired learning outcomes of the programme).

8. Eligibility for NRI/PIO/FN

a) A candidate in any of these categories shall have completed 17 years of age on or before 31st December 2023.

b) He/she must have Physics, Chemistry, Maths and English (and desirably Biology or Life Sciences) at the CBSE, ISC, HSC or an equivalent examination.

c) In thecase of a student from any school that follows the American system of education, the candidate must have studied Physics, Chemistry and Mathematics, carrying 100 marks (25 marks each for Physics &Chemistry and 50 marks for Mathematic subject).

d) Maths (and desirably Biology) at AP'(Advanced Placement)level and must have minimum 'C' grade in these subjects. In the case of students passing Cambridge International Examination (CIE) the candidate should have passed Physics, Chemistry and Maths at “Advanced” level along with English at “Advanced Subsidiary” (AS) level.

*Note: Reservation will be as per directives of the Government of India, for universities established under Section 3 of UGC Act 1956 by Govt. of India, through the University Grants Commission as and when received.

9. General Category:

Admissions to this category shall be made on the basis of the merit of the candidates, who have qualified at the AIBTAIET-2023. NRI/PIO/FN Category: A candidate belonging to this category is not required to appear at the AIBTAIET-2023. However, he/she shall submit a separate application, in the prescribed form, available in the Vidyapeeth office and on the Vidyapeeth website. A committee, appointed by the competent authority for the purpose shall admit candidates on the basis of their inter se merit. The candidate will be required to pay a processing fee of US $ 200. In case any seat earmarked for NRI/PIO/FN is not filled in by the candidate(s) of any of these subcategories, the Management shall fill in such vacant seat(s) from the candidate(s) who has/have cleared the AIBTAIET-2023 and has/ have applied for the seat separately in the prescribed form available in the Vidyapeeth office and website.

10. Discipline & Code of Conduct:

10.1 Obligations of the Student

10.1.1 Conduct himself / herself properly

10.1.2 Maintain proper behavior.

10.1.3 Observe strict discipline both within the campus, hostel & outside of the Institution.

10.1.4 Ensure that no act of his / her consciously or unconsciously brings the Institution or any establishment or authority connected with it into disrespect.

10.2 Any act/s by the student which is contrary to the clause (1), shall constitute misconduct and/or indiscipline, which include any one or more of the acts jointly or severally, mentioned hereinafter;

10.2.1 Any act of the student which directly or indirectly causes or attempts to cause disturbance in the lawful functioning of the Institution.

10.2.2 The student who is repeatedly absent from the class, lectures, tutorials, practicals and other courses.

10.2.3 The student not abiding by the instructions of the Faculty members and not interacting with them with due respect.

10.2.4 Any student found misbehaving in the campus/class or behaving arrogantly, violently towards the faculty, staff or fellow student.

10.2.5 The Students who is not present for all the class tests, midterm tests, terminal and preliminary examinations.

10.2.6 Permitting or conniving with any person / parent / guardian, which is not authorized to occupy hostel room, residential quarter, or any other accommodation or any part thereof of the Institution.

10.2.7 Obstruction to any student or group of students in any legitimate activities, in classrooms / laboratories / field or places of social and cultural activities within the campus of the Institute.

10.2.8 Possessing or using any fire arms, lethal weapon, explosives, or dangerous substances in the premises of the Institution.

10.2.9 Indulging in any act which would cause embarrassment or annoyance to any student / authority / staff or any member of the staff.

10.2.10 Stealing or damaging any farm produce or any property belonging to the Institution, staff member or student.

10.2.11 Securing admission in the Institution, to any undergraduate or post graduate program or any other course by fabrication or suppression of facts or information.

10.2.12 If the student fails to complete the assignments regularly and has poor academic performance when assessed by the regular class teachers and internal assessment, he/she will not be allowed to appear for the Vidyapeeth examination.

10.2.13 If a student remains absent for lectures, practical or class test and examinations without prior permission of the principal or the head of the departments, she/he will not be compensated for extra class.

10.2.14 Students should read the notices regularly on notice boards in the academic complex, library and the department notice boards.

10.2.15 Damage of property of the college and its sister institutes like tampering with fixtures, fittings, equipment's, instruments, furniture, books, periodicals, walls, windows panels, vehicles etc., will be viewed very seriously.

10.2.16 Recording of any electronic images in the form of photographs, audio or video recording of any person without the person's knowledge; when such recording is likely to cause injury, distress, or damage the reputation of such person; is prohibited in any part of the College and hostel premises. The storing, sharing or distributing of such unauthorized records by any means is also prohibited.

10.2.17 Use of mobile phones and head phones during college hours is prohibited.

10.2.18 As per the rules and regulations of the Dr. D.Y. Patil Vidyapeeth, Pimpri, Pune, 80% attendance in a subject for appearing in the examination is compulsory inclusive of attendance in non-lecture teaching i.e. seminars, group discussion, tutorials, demonstrations, practical's, hospital (tertiary, secondary, primary) posting and bedside clinics etc.

10.2.19 The Students must present in proper dress code with apron/ lab coat, name badge and identity card on all week days/working days and during clinical duties.

10.2.20 Admission of the student will be cancelled at any point of time in case of;

10.2.20.1 Not submitting the required documents on time.

10.2.20.2 Failing to fulfil required eligibility criteria of the program.

10.2.20.3 Submission of fake or incorrect documents.

10.2.20.4 Admission gained by resorting to fraudulent means, illegal gratification or any unfair practice detected at any stage during the entire program.

10.2.20.5 Not paying the stipulated fees on time.

11. Attendance & Progress:

Each student shall always maintain decency, decorum and good conduct, besides keeping steady progress and require attendance. The conduct/ academic performance/ attendance of each student shall be reviewed periodically and appropriate action, including detaining from appearing for the Vidyapeeth Exam/ expelling from the Hostel or College, as the case may be, will be taken against the erring student. The students shall abide by such decision of the authorities of the Institution/Vidyapeeth.

12 Payment of Tuition and other Fees

12.1 On admission of candidates to the first year of the course of study, all the notified fees viz., annual tuition fee, registration and eligibility fee, health insurance, caution deposit, hostel and mess fee, etc., as applicable, should be paid on or before the prescribed date without fail. Any delay will attract penalty as specified. If any candidate fails to remit tuition fee and other fees within the last date as notified, he/she will forfeit his/her admission to the course concerned.

12.2 In respect of subsequent year(s) of study, tuition fee and other specified fees shall be paid on or before the date as notified to the parents/students and on the Notice Board of the Institution/College concerned. Late payment, if any, will attract penalty as specified.

12.3 Similarly, examination fee, as prescribed and notified from time to time, shall be paid on or before the due date. If there is any delay, student has to pay penalty as specified. If any student fails to remit the examination fee even after lapse of the period specified for payment with penalty, such student will not be issued Hall Ticket for the Vidyapeeth examination (s) / debarred from appearing in the Vidyapeeth examination (s).

12.4 All fees, once paid to the Vidyapeeth account, will not be refunded or adjusted for any other purpose under any circumstances.

13. Rules relating to Vidyapeeth examinations:

13.1 The candidates appearing for the Vidyapeeth theory examinations shall be under the direct disciplinary control of the Centre-in-charge. Possessionof cell phone or any electronic device or incriminatory materials by a candidate or found copying from any device in the examination hall, is strictly prohibited.

13.2 Disciplinary action will be initiated if any candidate indulges in any malpractice (unfair means) as enumerated in the Vidyapeeth Examination Manual.

14. Rules for Hostel Students All inmates of the Hostel shall observe the following rules for the smooth and efficient running of the hostel and for their comfortable stay: -

14.1 Only bonafide students of Vidyapeeth are eligible for admission to the hostels.

14.2 Students who fail to remit the Hostel fee even after a reminder in writing, shall vacate the hostel room allotted to them, forthwith.

14.3 No posters or pictures should be stuck inside and outside the room or anywhere around the premises of the hostel or College. Hostlers should avoid sticking bills and posters on the windows, doors and walls (except name strips on the room door). In case the room is found not in order, fine will be levied on the erring student.

14.4 Inmates should switch off fans and lights before leaving their rooms.

14.5 The inmates are advised to close the taps after use in order to avoid wastage of water.

14.6 Dining services will be provided only in the mess and there will be no room service.

14.7 Whenever any hosteller falls sick the same should be reported by him/her to the warden who will provide all necessary assistance to get appropriate treatment or medicines.

14.8 While going out of hostel the students should enter their name in the register & sign the same by mentioning proper reason.

14.9 To leave the hostel premises, permission of the Chief Warden is absolutely necessary. Students who want to stay overnight to visit their parents or guardians should approach the Chief Warden for permission. Permission will be granted only after obtaining written request from the parent/guardian duly signed by them, which will be duly entered in a register maintained in each block by the Warden.

14.10 All rooms, corridors, toilets etc. must be kept clean and any student who violates the rule shall be expelled from the hostel.

14.11 Hostel facility is provided with a view to help the student to pursue his/her studies in good environment and to facilitate/ promote his/her academic progress.

All students will be governed by the rules stated above and by those that will be framed from time to time during the academic year.

Failure on the part of the students to abide by the disciplinary rules will result in such punishment including expulsion from the College/Hostel as may be imposed by the Institution / Vidyapeeth/ Head of the Institution.

The decision of the Institution/Vidyapeeth/Head of the Institution with regard to disciplinary cases shall be final and all the students shall abide by such decisions.

15 Powers of Competent Authority (Dean/Principal/ Director at the Institute level)

The Competent authority may impose any one or more of the following punishment/s on the student found guilty of misconduct, indiscipline, in proportion thereof:

15.1 Warning/reprimand

15.2 Fine

15.3 Cancellation/withheld scholarship / award / prize / medal.

15.4 Expulsion from the Hostel.

15.5 Expulsion from the institution

15.6 Cancellation of the result of the student concerned in the examination of the Institution.

15.7 Temporary annulment from the Hostel/ Institution.

15.8 Rustication from the Institution.

16. Procedure for Inquiry

If the competent authority is satisfied that there is a prima facie case inflicting penalty, mentioned in clause No. 8, the authority shall make inquiry, in the following manner:

16.1 Due notice in writing shall be given to the student concerned about his alleged act of misconduct /indiscipline.

16.2 Student charged shall be required within 15 days of the notice to submit his/her written representation about such charge/s.

16.3 If the student fails to submit written representation within specified time limit, the inquiry may be held-ex-parte.

16.4 If the student charged desired to see the relevant documents, such of the documents, as are being taken into consideration for the purpose of proving the charge/s, may at the discretion of the inquiry authority, be shown to the student.

16.5 The student charged shall be required to produce documents, if any in support of his defense. The inquiry authority may admit relevant evidence / documents.

16.6 Inquiry Authority shall record findings on each implication ofmisconduct or indiscipline, and the reason for such finding and submit the report along with proceedings to the competent Authority

16.7 The competent Authority on the basis of findings, shall pass such orders as it deems fit.

17. Appeal

If the punishment/fine/rustication is imposed on a student by Dean/Principal/ Director, such a student shall be entitled to file an appeal before the Vice- Chancellor within thirty (30) days of the receipt of the order

Dr D. Y. Patil School of Science & Technology,
Dr D. Y. Patil Vidyapeeth, Pimpri, Pune

Bachelor of Technology

Program Outcomes (POs)

Learners are expected to know and be able to–

PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, Engineering fundamentals, andan Engineering specialization to the solution of complex Engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature and analyze complex Engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
PO3	**Design / Development of Solutions**	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO4	**Conduct Investigations of Complex Problems**	Use research-based knowledge and research methods including design ofexperiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern ToolUsage**	Create, select, and apply appropriate techniques, resources, and modernEngineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO6	**The Engineer andSociety**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilitiesrelevant to the professional engineering practices.
PO7	**Environment and Sustainability**	Understand the impact of the professional Engineering solutions in societal andEnvironmental 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 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	**CommunicationSkills**	Communicate effectively on complex Engineering activities with the Engineeringcommunity 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 Engineering and managementprinciples 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 inindependent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

A graduate of the Computer Engineering Program will demonstrate-	
PSO1	**Professional Skills**-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexities.
PSO2	**Problem-Solving Skills**- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
PSO3	**Successful Career and Entrepreneurship**- The ability to employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and to have a zest for higher studies.

COURSE STRUCTURE FOR B. TECH. COMPUTER SCIENCE AND DESIGN

SEMESTER I						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
BSC 101	Physics	3	0	2	5	4
BSC 102	Chemistry	3	0	2	5	4
ESC 101	Basic Electronics and Electrical Engineering	2	0	2	4	3
ESC 102	Fundamentals of programming Languages	3	0	4	7	5
HSMC 101	Communication Skills	1	2	0	3	3
BSC 103	Mathematics	3	0	0	3	3
Total		**15**	**2**	**10**	**27**	**22**
SEMESTER II						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
ESC 201	Problem Solving by Programming	3	0	4	7	5
BSC 201	Computational Statistics	3	0	0	3	3
BSC 202	General Biology	2	0	0	2	2
ESC 202	Engineering Graphics and Design	1	0	4	5	3
ESC 203	Engineering Mechanics	3	0	0	3	3
ESC 204	Project Based Learning –I	0	0	4	4	2
ESC 205	Workshop and manufacturing practices-laboratory	0	0	4	4	2
Total		**12**	**0**	**16**	**28**	**20**

SEMESTER III						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
ESC-CS-301	Data Science	1	0	2	3	**2**
ESC-CS 302	Web Technology	2	1	2	5	**4**
ESC-CS 303	Object Oriented Programming	2	1	2	5	**4**
ESC-CS 304	Database Management System	2	1	2	5	**4**
PCC-CS 301	Engineering Design & Innovation-I	0	0	12	12	**6**
PCC-CS 302	Design Thinking -I	2	1	2	5	**3**
PEC-CS 301	Skill Enhancement Course-I	1	0	0	1	**1**
Total		**10**	**4**	**22**	**36**	**24**
SEMESTER IV						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
ESC-CS 401	Advanced Data Structure	2	1	2	5	4
ESC-CS 402	Discrete Structure and Automata Theory	2	1	2	5	4
ESC-CS 403	Computer Network	2	1	2	5	4
ESC-Cs 404	Data Visualization	2	1	2	5	4
PCC-CS-401	Engineering Design & Innovation-II	0	0	12	12	6
PCC-CS-402	Design Thinking -II	0	1	0	1	1
PEC-CS 401	Skill Enhancement Course-II	1	0	0	1	**1**
Total		**9**	**5**	**20**	**34**	**24**

Skill Enhancement Course-I: Object Oriented Programming - C++/JAVA
Skill Enhancement Course-II: Front end development with HTML5, CSS3/ Design Framework- Django/ AnjularJS/ ReactJS

SEMESTER V

Course Code	Course Name	L	T	P	Hr	Cr
ESC-CS 501	Artificial Intelligence	3	0	2	5	4
ESC-CS 502	Operating System	3	0	2	5	4
ESC-CS 503	Animation Design Principles	3	0	2	5	4
ESC-CS 504	Machine Learning	2	0	2	5	4
PCC-CS-501	Engineering Design & Innovation-III	0	0	4	4	2
PCC-CS-502	Design & Thinking	0	2	0	2	2
PEC-CS 501	Skill Enhancement Course-III	2	0	0	2	2
Total		**13**	**2**	**12**	**28**	**22**

SEMESTER VI

Course Code	Course Name	L	T	P	Hr	Cr
ESC-CS 601	Cloud Computing	3	0	2	5	4
ESC-CS 602	Multimedia Techniques & Tools	3	0	2	5	4
ESC-CS 603	Complexity and Algorithms	3	0	2	5	4
ESC-CS 604	Software Design and Methodologies	2	0	2	5	4
PCC-CS-601	Engineering Design & Innovation-IV	0	0	4	4	2
PCC-CS-602	Design Thinking	0	2	0	2	2
PEC-CS 601	Skill Enhancement Course-IV	2	0	0	2	2
Total		**13**	**2**	**12**	**28**	**22**

Skill Enhancement Course-III-Language-I: (Foreign Language(French/German/Japanese)/ Hindi/Marathi)
Skill Enhancement Course-IV-Language-II: (Foreign Language(French/German/Japanese)/ Hindi/Marathi)

SEMESTER VII

Course Code	Course Name	L	T	P	Hr	Cr
PEC-CS 701	Skill Enhancement Course-V	2	0	0	2	2
PCC-AI 702	Project- I/ Internship	0	0	28	28	14
Total		**2**	**0**	**28**	**30**	**16**

Skill Enhancement Course-V: Graphics Design UI/UX/Computer Vision/Computer Game Design/Application Development Augmented using Reality & Virtual Reality/ Computer Game Design

SEMESTER VIII

Course Code	Course Name	L	T	P	Hr	Cr
PEC-CS 801	Skill Enhancement Course-VI	2	0	28	2	2
PCC-AI 802	Project- II/ Internship	0	0	28	28	14
Total		**2**	**0**	**28**	**30**	**16**

Skill Enhancement Course-VI: R programming/ tableau/PowerBI/SAS/Google Analytics

TOTAL CREDITS-168

EVALUATION SCHEME (THEORY)

Examination	**Duration**	**Marks**
I Internal	45 minutes	20
II Internal	30 minutes	15
Attendance		5
End Semester	2 hours 30 minutes	60
Total		**100**

PRACTICAL EVALUATION SCHEME

Examination Marks		
Practical Internal (Continuous) assessment	**:**	**40**
End semester examination	**:**	**60**
Total	**:**	**100**

Course Code:

BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Professional Core Course
PEC	Professional Elective Course
HSMC	Humanities & Social Sciences including Management

SEMESTER - I

SEMESTER I						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
BSC 101	Physics	3	0	2	5	4
BSC 102	Chemistry	3	0	2	5	4
ESC 101	Basic Electronics and Electrical Engineering	3	0	2	5	4
ESC 102	Fundamentals of programming Languages	3	0	4	7	5
HSMC 101	Communication Skills	1	2	0	3	3
BSC 103	Mathematics	3	0	0	3	3
Total		**16**	**2**	**10**	**28**	**23**

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BSC 101 : Physics

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	04	Internal Assessment (TH): 40 Marks
Practical: 02 Hours/Week		End Semester (TH): 60 Marks

Course Objective:

The objective of this course is:

1. To create general understanding regarding basic physical principles involved in living systems.
2. To familiarize the student with basic concepts in classical physics such asclassical optics used in microscopes and telescopes, mechanics, fluid properties, oscillations and waves, electricity and magnetism
3. To introduce them to concepts in modern physics such as production ofX-rays, X-ray crystallography, quantum mechanics etc.

Course Outcomes:

Upon successful completion of this course, students will be able to:

CO1: Understand the basic concepts in physics and understand the properties of fluids, viscosity and surface tension.

CO2: Understand the basic properties of solids like elasticity and measure the Modulus by stress and strain curve.

CO3: Understand the concept of Oscillations and different types of waves

CO4: Learn about the optics, diffraction and their types, types of interference

CO5: Demonstrate the calculations of electricity and learn the different laws.

CO6:Demonstrate the concepts in modern physics such as- X-rays, crystallography and quantum Mechanics

CO7: Understand the various laser and their applications.

Prerequisites

This is an introductory course. School level knowledge of physics is sufficient.There are no prerequisites.

Unit I	Newtonian Mechanics and Fluids Properties	(10Hours)

Forces in Nature; Newton‘s laws and itscompleteness in describing particle motion; Potential energy function; F = - Grad V, Conservative and non-conservative forces, Central forces Surface Tension, Surface Energy, Angleof Contact, Capillarity action, Determination of Surface tension by capillary rise method Viscosity, Coefficient of viscosity, Streamline and turbulent flow, Reynold‘s number,Stoke‘s law, Terminal velocity, Determination of _η‘ by falling sphere method.		
Mapping of Course Outcomes	CO1	
Unit II	**Elasticity**	**(03 Hours)**
Stress and Strain, Hook‘s law, Stress-strain curve, Young‘s modulus, Determination of Young‘s modulus		
Mapping of Course Outcomes	CO2	
Unit III	**Oscillations and Waves**	**(06 Hours)**
Simple harmonic motion, Transverse wave on a string, The wave equation on a string, Reflection and transmission of waves at a boundary, Sound waves: Audible, Ultrasonic and Infrasonicwaves, Beats, Doppler effect, Applications of Ultrasonic waves.		
Mapping of Course Outcomes	CO3	
Unit IV	**Optics: Interference Diffraction & Polarization**	**(08 Hours)**
Introduction to optics, Principles of superposition, Constructive & Destructive Interference, Types of Interference, Newton‘s rings. Diffraction- Types of diffraction, Diffraction grating, Rayleigh‘s criterion, Resolving power of Microscope and Telescope. Polarization of light waves, Polaroid, Optical activity.		
Mapping of Course Outcomes	CO4	
Unit V	**Electricity, Magnetism, Electromagnetic Induction**	**(07 Hours)**
Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace‘s and Poisson‘s equations for electrostatic potential; Heating effect of electric current, Joule‘s law , Bio-Savart law,Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes‘ theorem Faraday‘s law in terms of EMFproduced by changing magnetic flux; Transformers, Types of Transformers.		
Mapping of Course Outcomes	CO5	
Unit VI	**Modern Physics: Xrays, Crystallography, Introduction to Quantum Mechanics**	**(08 Hours)**
Introduction to X-Rays: Introduction,Production of X-rays, X-Ray diffractionand its Applications. Plank‘s Quantum Theory, Properties of Photon, Photoelectric effect, Wave particle duality of radiation, De Broglie‘s hypothesis, Heisenberg‘s Uncertaintyprinciple. The Schrodinger equation for wave function, Statistical interpretation, Probability, Momentum		

Mapping of Course Outcomes	CO6	
Unit VII	**Lasers**	**(06 Hours)**
Properties of Lasers, Production mechanism, Ruby Laser, Helium Neon Laser, applications of Lasers		
Mapping of Course Outcomes	CO7	

Learning Resources

Methodology

The course will be covered through lectures and supported by practical.

Reference Books:

1. Physics by D. Haliday and R. Resnik 5th edition, Wiley Eastern Pub, 2007.
2. Perspectives of Modern Physics by A. Beiser, 6th edition, Mc Graw Hill,2003.
3. Fundamensls of optics by F. A. Jenkins and H. E. White, 4th edition, McGraw Hill, 1976.
4. Optics by A. Ghatak, 3rd edition, Tata Mc Graw Hill, 2006.
5. David Griffiths, Introduction to Electrodynamics, 3rd edition, 1999,Prentice Hall
6. David Griffiths, Introduction to Quantum Mechanics, 2nd edition, 2005,Prentice Hall

Practical :

1. Diffraction Grating: Use of diffraction grafting for determination ofwavelength of
2. Spectral lining.
3. Resolving Power: To determine the resolving power of Microscope ortelescope
4. Ultrasonic Interferometer: Determination of velocity of ultrasonic wavesby ultrasonic
5. Surface Tension: Determination of the surface tension of a given solution.
6. Viscosity: Determination the coefficient of viscosity by Stoke‘s methodand its
7. Practical application.
8. Joule‘s Law: Determine of Joule‘s constant.
9. Determination of wavelength of monochromatic light by Newton‘s ringsexperiments.

@The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO12
CO1	1	1	2	1	-	-	-	-	-	-	-	-
CO2	1	2	-	2	-	-	-	-	-	-	-	-

CO3	2	1	2	1	-	-	-	-	-	-	-	-
CO4	1	2	-	2	-	-	-	-	-	-	-	-
CO5	-	-	2	-	-	-	-	-	-	-	-	-
CO6	-	2	1	2	-	-	-	-	-	-	-	-

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BSC 102: Chemistry

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	04	Internal Assessment (TH): 40 Marks
Practical: 02 Hours/Week		End Semester (TH): 60 Marks

Course Objective:

1. The objective of this course is to familiarize the student with the different concepts of physical and organic chemistry.
2. The students will learn the structures of organic molecules as: alkanes, alkenes, alkynes, aliphatic and aromatic molecules and the stereochemistry behind the molecules with its importance in day today life
3. They would learn the Basic concepts and principles with respect to physical chemistry, the bioenergetics of different reactions and the principles and applications of radioactivity.

Course Outcomes:

The course will enable the student to:

CO1: Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
CO2: Rationalize bulk properties and processes using thermodynamic considerations. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
CO3: Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
CO4: List major chemical reactions that are used in the synthesis of molecules.
CO5: understand ionization energies and variations in Periodic atoms
CO6: configuration and representation of isomers
CO7: addition, oxidation, elimination and substitution of reaction

Prerequisites:

This is the introductory course and there are no prerequisites.

Unit I	**Atomic and molecular structure**	**(10 Hours)**
Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity.		
Mapping of Course Outcomes	CO1	
Unit II	**Spectroscopic techniques and applications**	**(07 Hours)**
Principles of spectroscopy Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic, molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging		

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Mapping of Course Outcomes	CO2	
Unit III	**Intermolecular forces and potential energy surfaces**	**(04 Hours)**
Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.		
Mapping of Course Outcomes	CO3	
Unit IV	**Thermo- dynamics**	**(08 Hours)**
Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Use of free energy considerations in metallurgy through Ellingham diagrams.		
Mapping of Course Outcomes	CO4	
Unit V	**Periodic properties**	**(06 Hours)**
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries		
Mapping of Course Outcomes	CO5	
Unit VI	**Stereo- chemistry**	**(06 Hours)**
Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds		
Mapping of Course Outcomes	CO6	
Unit VII	**Organic reactions**	**(05 Hours)**
Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.		
Mapping of Course Outcomes	CO7	

Methodology

The course will be covered through lectures, demonstration and practical.

Reference Books:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Ed. http://bcs.whfreeman.com/vollhardtschore5e/ default.asp

Practical:

1	Determination of surface tension and viscosity
2	Spectroscopy
3	Measurement of Optical activity.
4	Determination of chloride content of water OR Chemical analysis of a salt
5	Colligative properties using freezing point depression
6	Determination of the rate constant of a reaction
7	Determination of cell constant and conductance of solutions
8	Potentiometry - determination of redox potentials and emfs
9	Determination of the partition coefficient of a substance between two immiscible liquids
10	Adsorption of acetic acid by charcoal

@The CO-PO Mapping Matrix

CO \PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	1	2	1	-	-	-	-	-	-	-	-
CO 2	1	2	-	2	-	-	-	-	-	-	-	-
CO 3	2	1	2	1	-	-	-	-	-	-	-	-
CO 4	1	2	-	2	-	-	-	-	-	-	-	-
CO 5	-	-	2	-	-	-	-	-	-	-	-	-
CO 6	-	2	1	2	-	-	-	-	-	-	-	-
Co 7	1	2	2	-	-	-	-	-	-	-	-	-

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ESC 102: Fundamentals of Programming Languages

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	05	Internal Assessment (TH): 40 Marks
Practical: 04 Hours/Week		End Semester (TH): 60 Marks

Course Objective:

The objective of the course is

1. To familiarize the students with computers and programming concepts.
2. Programming module is intended to familiarize them with computer logicand solution of real-world problems using C and C++ programming languages.

Course Outcomes:

At the end of this course, students will be able to:

CO1: Understand the organization of computers and the basic principles ofComputing

CO2: Deal with the basics problems that arise while using computers

CO3: Demonstrate the basics of C Programing and their applications

CO3: Demonstrate the basics of object-oriented programming (C++)

CO4: Apply programming for solving biological problems by logic-basedapproach

CO5: Understand the different types of array and string

CO6: Demonstrate the pointer with array and function

CO7: Understand the structure, union, enumeration

CO8: Different file handling function

Prerequisites:

The course requires the basic knowledge about the Computer system.

Unit I	**Basics of programming & Introduction to C**	**(08 Hours)**
History of computer and various parts and functions performed by them , Various hardware of computer, Application software and system software , Various functions of operating system, MS-DOS, LINUX commands, Machine language, High level language, Compilation process ,An overviewof C, C expressions, Operators, Data types		
Mapping of Course Outcomes	CO1	

Unit II	The Decision controls and Control structures	(08 Hours)
If statements within if, Multiple statements within if, if-else statement, The! operator Hierarchy of Logical Operators, The Conditional Operators. What are Control structures, need of controlstructures , While‘ Loop, for‘ loop , Nesting of Loops , Multiple Initializations in the for loop The Odd‘ Loop, The break‘ statement, The continue‘ statement, The do-while‘ statement, Decisions using switch , Go To Statements		
Mapping of Course Outcomes	CO2	
Unit III	**Functions, Pointers and Structures**	**(08 Hours)**
What is a function? Why Use Functions Passing values between functions, Scope offunction. Pointer variables , The pointer Operators , Pointer Expressions , Pointers and Arrays , Initializing Pointers, Pointers to Functions, C‘s Dynamic Allocation Arrays Structures, Arrays of structures, Passingstructures to functions, Structure Pointers, Unions, Bit-Fields , Enumerations ,Typedef		
Mapping of Course Outcomes	CO4, CO6,CO7	
Unit IV	**Array & strings**	**(08 Hours)**
Single-dimension Arrays, Generating aPointer to an array, Passing single dimension, arrays to functions, Strings, Two- dimensional Arrays, Arrays of Strings, Multidimensional Arrays, Array ,Initialization, Variable-Length arrays Whatare Strings? More about Strings , Pointers andStrings , Standard Library String functions,Two-Dimensional Array of Characters, Array of pointers to Strings		
Mapping of Course Outcomes	CO5	
Unit V	**File Handling in C**	**(08 Hours)**
Opening and closing a stream, open modes, Reading and writing to/from a stream, Predefined streams: stdin, stdout and stderr, Stream manipulation: fgetc(), fputc(), fgets() and fputs() functions		
Mapping of Course Outcomes	CO7	
Unit VI	**Introduction To Object- Oriented Programming (C++)**	**(08 Hours)**
Introduction – Procedure vs. object oriented programming – Data types – control structures – Arrays and Strings – User definedtypes – Functions and Pointers – Case study ,Classes and Objects – Operator Overloading – Inheritance – Polymorphism and VirtualFunctions – Case study		
Mapping of Course Outcomes	CO3	

Reference Books:

1. The complete reference of C by H. Schildt, 4th edition, Mc Graw Hill,2003.
2. Let us C By Y. Kanitkar, 15th edition, BPB Publication, 2017.
3. Data Structure Through C by Y. Kanitakar, 2nd edition, BPB Publication,2003.
4. Understanding Pointers in C by Y. Kanitakar, 4th edition, BPB Publication,2007.
5. Data Structure using C and C++ by A. M. Taneumbam, 2nd edition, PHI,2017.
6. Computers Fundamentals by P K Sinha and P. Sinha, 6th edition, BPBpublications, 2004.

7. HM Deitel and PJ Deitel —C++ How to Program‖, Seventh Edition, 2010,Prentice Hall.
8. E Balagurusamy, —Object oriented Programming with C++‖, Thirdedition, 2006, Tata McGraw Hill.

Methodology:

The course will be covered through lectures, demonstration and practical**.**

Practical's:

1 Introduction to Microsoft Word and Microsoft Power point
2 Introduction to Microsoft Excel and MS-DOS commands
3 Programs on basic programming in C
4 Programs using Decision Controls in C
5 Programs using while, do-while and for Loop
6 Programs using Case Control Structure, odd loop
7 Programs illustrating use of function
8 Programs illustrating use of arrays
9 Programs using Pointers and Structure
10 Programs illustrating use of String
11 Programs for file handling in C
12 Programs in basic programming in C++
13 Basic programs for object-oriented concepts using C++
14 Programs for Biological application
- Finding complement of DNA
- ORF finding
- Inverted Repeats
- Motif finding
- Translation
- Transcription

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1	PO 12
CO	1	1	2	1	-	-	-	-	-	-	-	-
CO 2	1	2	-	2	-	-	-	-	-	-	-	-
CO 3	2	1	2	1	-	-	-	-	-	-	-	-
CO 4	1	2	-	2	-	-	-	-	-	-	-	-
CO	-	-	2	-	-	-	-	-	-	-	-	-

5												
CO 6	-	2	1	2	-	-	-	-	-	-	-	-
Co7	1	2	2	-	-	-	-	-	-	-	-	-

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HSMC 101: Communication Skills

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 01 Hours/Week	03	Internal Assessment (TH): 40 Marks End Semester (TH): 60 Marks

Course Objective:

1. Understand the role of communication in personal & professional success.
2. Develop awareness of appropriate communication strategies.
3. Prepare and present messages with a specific intent.
4. Analyze a variety of communication acts.
5. Ethically use, document and integrate source

Course Outcomes:

CO1: The student will acquire basic proficiency in English including reading andlistening comprehension, writing and speaking skills.
CO2: Develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others.
CO3:Understand and practice different techniques of communication
CO4: Practice and adhere to the 7Cs of Communication.
CO5: Familiarize with different types of Communication.
CO6: Understand and practice Interview Etiquettes.

Unit I	**Vocabulary Building**	**(03 Hours)**
The concept of Word Formation, Root words from foreign languages and their usein English, Acquaintance with prefixes andsuffixes from foreign languages in English to form derivatives., Synonyms, antonyms,and standard abbreviations.		
Mapping of Course Outcomes	CO1	
Unit II	**Basic Writing Skills**	**(03 Hours)**
Sentence Structures, Use of phrases and clauses in sentences Importance of proper punctuation, Creating coherence Organizing principles of paragraphs in documents, Techniques for writing precisely		
Mapping of Course Outcomes	CO2	
Unit III	**Identifying Common Errors in Writing**	**(03 Hours)**
Subject-verb agreement, Noun-pronounagreement Misplaced modifiers, Articles, PrepositionsRedundancies, Clichés		
Mapping of Course Outcomes	CO3	
Unit IV	**Nature and Style of sensible Writing**	**(08 Hours)**

Describing, Defining, Classifying,Providing examples or evidence, Writing introduction and conclusion		
Mapping of Course Outcomes	CO4	
Unit V	**Writing Practices**	**(08 Hours)**
Comprehension, Précis Writing, EssayWriting		
Mapping of Course Outcomes	CO5	
Unit VI	**Oral Communication**	**(08 Hours)**
(This unit involves interactive practice sessions in Language Lab) Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations		
Mapping of Course Outcomes	CO6	

Reference Book:

a. Practical English Usage. Michael Swan. OUP. 1995.
b. Remedial English Grammar. F.T. Wood. Macmillan.2007
c. On Writing Well. William Zinsser. Harper Resource Book. 2001
d. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
e. Communication Skills Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
f. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1	PO 12
CO	1	1	2	1	-	-	-	-	-	-	-	-
CO 2	1	2	-	2	-	-	-	-	-	-	-	-
CO 3	2	1	2	1	-	-	-	-	-	-	-	-
CO 4	1	2	-	2	-	-	-	-	-	-	-	-
CO 5	-	-	2	-	-	-	-	-	-	-	-	-
CO 6	-	2	1	2	-	-	-	-	-	-	-	-
Co7	1	2	2	-	-	-	-	-	-	-	-	-

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BSC 103: Mathematics

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	03	Internal Assessment: 40 Marks
		End Semester: 60 Marks

Course Objective

The objective of the course is to familiarize the student with basic concepts inmathematics.

Course Outcomes

The objective of this course is to familiarize the prospective engineers withtechniques in calculus, multivariate analysis and linear algebra. It aims to equipthe students with standard concepts and tools at an intermediate to advancedlevel that will serve them well towards tackling more advanced level ofmathematics and applications that they would find useful in their disciplines. The students will learn:

CO1: To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.

CO2: The tool of power series and Fourier series for learning advanced Engineering Mathematics.

CO3: To deal with functions of several variables that are essential in most branches of engineering.

CO4: The essential tool of matrices and linear algebra in a comprehensive manner.

CO5: To deal with thermos, transformations, and equations.

Prerequisites

Students should be familiar with school level mathematics to take up this course. In case they do not have mathematics at the 10+2 level they should have cleared the core mathematics in the first semester.

Unit I	**Calculus**	**(06 Hours)**
Evaluate and involutes; Evaluation of definite and improper integrals; Beta andGamma functions and their properties; Applications of definite integrals to evaluate surface areas.		
Mapping of Course Outcomes	CO1	

Unit II	**Calculus**	**(06 Hours)**
Expansion of Functions: Taylor‘s seriesand Maclaurin‘s Series; Differential Calculus: Indeterminate Forms, L -Hospital’s Rule, Evaluation of Limits		
Mapping of Course Outcomes	CO2	

Unit III	Sequences and series	(10 Hours)
Infinite Sequences, Infinite Series,Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Range of convergence.		
Mapping of Course Outcomes	CO3	
Unit IV	**Multivariable Calculus**	**(08 Hours)**
Partial Derivatives, Euler's Theorem onHomogeneous Functions, ImplicitFunctions, Total Derivatives, Change of Independent Variables; Maxima and Minima of functions of two variables, Lagrange's method of undetermined multiplier		
Mapping of Course Outcomes	CO4	
Unit V	**Matrices**	**(10 Hours)**
Rank, Normal Form, System of Linear equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley Hamilton Theorem.		
Mapping of Course Outcomes	CO5	

Reference Book:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, JohnWiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill,New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill NewDelhi, 11th Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition,Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics,Laxmi Publications, Reprint.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36thEdition, 2010.
8. Dr. M.Y Gokhale, Dr. N.S. Mujumdar Engineering Mathematics-I, NiraliPrakashan, 8th Edition.

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1	PO 12
CO	1	1	2	1	-	-	-	-	-	-	-	-
CO 2	1	2	-	2	-	-	-	-	-	-	-	-
CO 3	2	1	2	1	-	-	-	-	-	-	-	-
CO 4	1	2	-	2	-	-	-	-	-	-	-	-
CO 5	-	-	2	-	-	-	-	-	-	-	-	-
CO 6	-	2	1	2	-	-	-	-	-	-	-	-
Co7	1	2	2	-	-	-	-	-	-	-	-	-

SEMESTER - II

SEMESTER II						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
ESC 201	Problem Solving by Programming	3	0	4	7	5
BSC 201	Computational Statistics	3	0	0	3	3
BSC 202	General Biology	2	1	0	3	3
ESC 202	Engineering Graphics and Design	1	0	4	5	3
ESC 203	Engineering Mechanics	3	0	0	3	3
ESC 204	Project Based Learning –I	0	0	4	4	2
ESC 205	Workshop and manufacturing practices-laboratory	0	0	4	4	2
	Total	**12**	**1**	**16**	**29**	**21**

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ESC 201 : Problem Solving by Programming

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	05	Internal Assessment (TH): 40 Marks
Practical: 04 Hours/Week		End Semester (TH): 60 Marks

Course Objective

Prime objective is to give students a basic introduction to programming and problem solving with computer language Python. And to introduce students not merely to the coding of computer programs, but to computational thinking,the methodology of computer programming, and the principles of good program design including modularity and encapsulation.

1. To understand problem solving, problem solving aspects, programming and to know about various program design tools.
2. To learn problem solving with computers
3. To learn basics, features and future of Python programming.
4. To acquaint with data types, input output statements, decision making, looping and functions in Python
5. To learn features of Object-Oriented Programming using Python.

Course Outcomes

On completion of the course, learner will be able to–

CO1: Inculcate and apply various skills in problem solving.

CO2: Choose most appropriate programming constructs and features to solvethe problems in diversified domains.

CO3: Exhibit the programming skills for the problems those require the writingof well- documented programs including use of the logical constructs of language, Python.

CO4: Demonstrate significant experience with the Python programdevelopment environment.

CO5: demonstrate with the polymorphism, inheritance, class, object like object oriented programming.

CO6: learn about the file handling and Dictionaries with case studies.

Prerequisites

Students are expected to have a good understanding of basic computer principles.

Unit I	Problem Solving, Programming and Python Programming General Problem Solving Concepts	(07 Hours)

Problem solving in everyday life, types of problems, problem solving with computers, difficulties with problem solving, Problem solving aspects, top down design. Problem Solving Strategies. **Program Design Tools:** Algorithms, Flowcharts and Pseudocodes, implementation of algorithms. **Basics ofPython Programming:** Features of Python, History and Future of Python, Writing and executing Python program, Literal constants, variables andidentifiers, Data Types, Input operation, Comments, Reserved words, Indentation, Operators and expressions, Expressions in Python.		
Mapping of Course Outcomes	CO1	
Unit II	**Decision Control Statements Decision Control Statements**	**(08 Hours)**
Decisioncontrol statements, **Selection/conditional** branching Statements: if, if-else, nested if, if elif-else statements. **Basic loop**Structures/Iterative statements: whileloop, for loop, selecting appropriate loop.Nested loops, The break, continue, pass,else statement used with loops. Other data types- Tuples, Lists and Dictionary.		
Mapping of Course Outcomes	CO2	
Unit III	**Functions and Modules**	**(08 Hours)**
Need for functions, **Function**: definition,call, variable scope and lifetime, the return statement. Defining functions, Lambda or anonymous function, documentation string, good programming practices. Introduction to modules, Introduction to packages in Python, Introduction to standard library modules.		
Mapping of Course Outcomes	CO3	
Unit IV	**Strings**	**(07 Hours)**
Strings and Operations- concatenation, appending, multiplication and slicing. Strings are immutable, strings formattingoperator, built in string methods and functions. Slice operation, ord() and chr() functions, in and not in operators, comparing strings, Iterating strings, the string module		
Mapping of Course Outcomes	CO4	
Unit V	**Object Oriented Programming**	**(08 Hours)**
Programming Paradigms-monolithic, procedural, structured and object oriented, Features of Object-oriented Programming classes, objects, methodsand message passing, inheritance, polymorphism,containership,reusability, delegation, data abstraction and encapsulation. **Classes and Objects**: classes and objects, class method and self-object,class variables and object variables, public and private members, class methods.		
Mapping of Course Outcomes	CO5	
Unit VI	**File Handling and Dictionaries**	**(08 Hours)**

Files: Introduction, File path, Types of files, Opening and Closing files, Readingand Writing files. Dictionary method. **Dictionaries-** creating, assessing, addingand updating values. **Case Study:** Studydesign, features, and use of any recent, popular and efficient system developed using Python. (This topic is to beexcluded for theory examination).

Mapping of Course Outcomes	CO6

Text Books:

1. Reema Thareja, ―Python Programming Using Problem Solving Approach‖, Oxford University Press, ISBN 13: 978-0-19-948017-6
2. R. Nageswara Rao, ―Core Python Programming‖, Dreamtech Press;Second edition ISBN-10: 938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL

Reference Books:

1. R. G. Dromey, ―How to Solve it by Computer‖, Pearson Education India;1st edition, ISBN- 8131705625, ISBN-13: 978-8131705629 Maureen Spankle, ―Problem Solving and Programming Concepts‖,
2. Romano Fabrizio, ―Learning Python‖, Packt Publishing Limited, ISBN:9781783551712, 1783551712
3. Paul Barry, ―Head First Python- A Brain Friendly Guide‖, SPD O'Reilly,2nd Edition, ISBN:978-93-5213-482-34
4. Martin C. Brown, ―Python: The Complete Reference‖, McGraw HillEducation, ISBN-10: 9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943
6. Jeeva Jose, P. Sojan Lal, ―Introduction to Computing & Problem Solvingwith Python‖,
7. Khanna Computer Book Store; First edition, ISBN-10: 9789382609810,ISBN-13: 978-938260981
8. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Practical :

1. Write a program to calculate salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employee pay professional tax as 2% of total salary. Calculate net salary payable after deductions.
2. To accept an object mass in kilograms and velocity in meters per second and display its momentum. Momentum is calculated ase=mc2 where m is the mass of the object and c is its velocity.
3. To accept student's five courses marks and compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinction. If aggregate is 60>= and <75 then the grade if first division. If aggregate is 50>= and <60, then the grade is seconddivision. If aggregate is 40>= and <50, then the grade is third division.
4. To accept N numbers from user. Compute and display maximum inlist, minimum in list, sum and average of numbers.
5. To check whether input number is Armstrong number or not. An Armstrong number is an integer with three digits such that the sumof the cubes of its digits is equal to the number itself. Ex. 371.
6. To accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorialof number e) prime factors
7. To accept two numbers from user and compute smallest divisor andGreatest Common Divisor of these two numbers.
8. To accept a number from user and print digits of number in a reverseorder.
9. To input binary number from user and convert it into decimal number.

10. To generate pseudo random numbers.
11. To accept list of N integers and partition list into two sub lists evenand odd numbers.
12. To accept the number of terms a finds the sum of sine series.
13. To accept from user the number of Fibonacci numbers to be generated and print the Fibonacci series. Write a python program thataccepts a string from user and perform following string operations-i. Calculate length of string ii. String reversal iii. Equality check of two strings iii. Check palindrome ii. Check substring
14. To copy contents of one file to other. While copying a) all full stopsare to be replaced with commas b) lower case are to be replaced with upper case c) upper case are to be replaced with lower case.
15. To count total characters in file, total words in file, total lines in fileand frequency of given word in file. Create class EMPLOYEE for storing details(Name, Designation, gender, Date of Joining and Salary).
16. Define function members to compute a) total number of employeesin an 18. organization b) count of male and female employee c)Employee with salary more than 10,000 d) Employee withdesignation ―Asst Manager
17. Create class STORE to keep track of Products (Product Code, Nameand price). Display menu of all products to user. Generate bill as perorder.
18. Program that simulates rolling dice. When the program runs, it willrandomly choose a number between 1 and 6 (Or other integer you prefer). Print that number. Request user to roll again. Set the 20. min and max number that dice can show. For the average die, that means a minimum of 1 and a maximum of 6.

Use raspberry pi/or similar kit and python for-

a) Room Temperature Monitoring System
b) Motion Detection System
c) Soil Moisture Sensor
d) Home Automation System
e) A robot
f) Smart mirror or a smart clock.
g) Smile Detection using Raspberry Pi Camera

19. Guess Number: Randomly generate a number unknown to the user. The user needs to guess what that number is. If the user‘s guess is wrong, the program should return some sort of indication as to how wrong (e.g. the number is too high or too low). If the user guesses correctly, a positive indication should appear.
20. Write functions to check if the user input is an actual number, to see the difference between the inputted number and the randomlygenerated numbers, and to then compare the numbers.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	1	-	-	-	-	-	-	-	-
CO2	1	2	-	2	-	-	-	-	-	-	-	-
CO3	2	1	2	1	-	-	-	-	-	-	-	-

CO4	1	2	-	2	-	-	-	-	-	-	-	-
CO5	-	-	2	-	-	-	-	-	-	-	-	-
CO6	-	2	1	2	-	-	-	-	-	-	-	-

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BSC 202: General Biology

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	02	Internal Assessment (TH): 20 Marks End Semester (TH): 30 Marks

Course Objective:

The objective of this course is to familiarize the students with basic conceptsin biology.

Course Outcomes:

After studying the course, the student will be able to:

CO1: Describe how biological observations of 18th Century that lead to majordiscoveries

CO2:Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical andecological

CO3: Highlight the concepts of recessiveness and dominance during thepassage of genetic material from parent to offspring

CO4: Convey that all forms of life have the same building blocks and yet themanifestations are as diverse as one can imagine

CO5: Classify enzymes and distinguish between different mechanisms ofenzyme action.

CO6: Identify DNA as a genetic material in the molecular basis of informationtransfer.

CO7: Analyze biological processes at the reductionistic level.

CO8: Identify and classify microorganisms.

CO9: Study of identification and classification of microbiology.

Prerequisites:

Basic school level knowledge in Biology.

Unit I	**Introduction**	**(04 Hours)**
Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that leadto major discoveries.		
Mapping of Course Outcomes	CO1	
Unit II	**Classification**	**(04 Hours)**
Discuss classification based on (a)cellularity Unicellular or multicellular (b) ultrastructure prokaryotes or eukaryotes. (c) energy and Carbonutilization -Autotrophs, heterotrophs,lithographs (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitata- aquatic or terrestrial (e) Molecular taxonomy		
Mapping of Course Outcomes	CO2	

Unit III	Genetics	(02 Hours)
Concept of allele. Gene mapping, Geneinteraction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Phases how genetic material passes from parent to offspring.		
Mapping of Course Outcomes	CO3	
Unit IV	**Biomolecules**	**(04 Hours)**
Discuss monomeric units and polymericstructures. Discuss about sugars, starch and cellulose. Amino acids and proteins.Nucleotides and DNA/RNA. Two carbon units and lipids.		
Mapping of Course Outcomes	CO4	
Unit V	**Enzymes**	**(02 Hours)**
How to monitor enzyme catalyzedreactions. How does an enzyme catalyze reactions. Enzymeclassification. Mechanism of enzyme action. Enzyme kinetics and kinetic parameters. RNA catalysis.		
Mapping of Course Outcomes	CO5	
Unit VI	**Information Transfer**	**(04 Hours)**
DNA as a genetic material. Hierarchy ofDNA structure from single stranded to double helix to nucleosomes. Conceptof genetic code.		
Mapping of Course Outcomes	CO6	
Unit VII	**Macromolecular Analysis**	**(04 Hours)**
Proteins- structure and function.Hierarch in protein structure. Primary secondary, tertiary and quaternarystructure. Proteins as enzymes, transporters, receptors and structural elements.		
Mapping of Course Outcomes	CO7	
Unit VIII	**Metabolism**	**(01 Hours)**
Exothermic and endothermic versusendergonic and exergonic reactions.Concept of Keq and its relation to Standard free energy. Spontaneity. ATPas an energy currency.		
Mapping of Course Outcomes	CO8	
Unit IX	**Microbiology**	**(01 Hours)**

Concept of single celled organisms. Concept of species and strains. Identification and classification of Microorganisms. Microscopy.		
Mapping of Course Outcomes	CO9	

Reference Books:

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons
3) Principles of Biochemistry (5th Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

Methodology

The course will be covered through lectures and tutorials

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1	PO 12
CO	1	1	2	1	-	-	-	-	-	-	-	-
CO 2	1	2	-	2	-	-	-	-	-	-	-	-
CO 3	2	1	2	1	-	-	-	-	-	-	-	-
CO 4	1	2	-	2	-	-	-	-	-	-	-	-
CO 5	-	-	2	-	-	-	-	-	-	-	-	-
CO 6	-	2	1	2	-	-	-	-	-	-	-	-
Co7	1	2	2	-	-	-	-	-	-	-	-	-

Total	**100**

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BT 203: Engineering Mechanics

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	03	Internal Assessment (TH): 40 Marks End Semester (TH): 60 Marks

Course Objective:

The objective of the course is to familiarize the students with the basic concepts of engineering mechanics.

Course Outcomes:

CO1: At the end of the course the students will have sufficient knowledge ofmechanical engineering techniques which will help them to implement them in the life sciences.

CO2: Principle of statics, Force system, Resolution and composition of forces, Resultant of concurrent, forces.

CO3: Types of beams, simple and compound beams, Type of supports andreaction.

CO4: Understand Simple Contact friction, Rolling Resistance & Belt Friction

CO5: Basic Concepts Equation of motion in Cartesian coordinates.

CO6: understand the kinetics Work, power, and energy conservative.

Prerequisites:

Since the course is technical in nature the students must have the basicknowledge of Math sans Physics.

Unit I	Module 1	(06 Hours)
Introduction, Units and Dimensions, Laws of Mechanics, Vectors – Victorian representationof forces and moments, Vector operations		
Mapping of Course Outcomes	CO1	
Unit II	**Module 2**	**(08 Hours)**
Principle of statics, Force system, Resolution and composition of forces, Resultant of concurrent, forces. Moment of a force, Varignon's theorem, resultant of parallel forcesystem, Couple, Equivalent force couple system, Resultant of parallel general force system		
Mapping of Course Outcomes	CO2	
Unit III	**Module 3**	**(08 Hours)**

Free body diagram Equilibrium of concurrent,parallel forces in a plane Equilibrium of general forces in a plane Equilibrium of three forces in a plane, Types of beams, simple and compound beams, Type of supports andreaction, Forces in space, Resultant of concurrent and parallel forces in a space, Equilibrium of concurrent and parallel forces in a space.		
Mapping of Course Outcomes	CO3	
Unit IV	**Module 4**	**(04 Hours)**
Frictional Force, Laws of Coulomb friction,Simple Contact friction, Rolling Resistance & Belt Friction		
Mapping of Course Outcomes	CO4	
Unit V	**Module 5**	**(07 Hours)**
Kinematics of linear motion- Basic concepts Equation of motion for constant acceleration Motion under gravity, Variable accelerationmotion curves. Kinematics of curvilinear motion- Basic Concepts Equation of motion inCartesian coordinates Equation of motion in path coordinates Equation of motion in polar coordinates Motion of projectile.		
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Module 6**	**(07 Hours)**
Kinetics- Newton‘s Second Law of motion Application of Newton‘s Second Law. Work, power, energy, conservative and non- conservative forces Conservation of energy formotion of particle, Impulse, Momentum, Direct central impact. Coefficient of restitution, Impulse Momentum principle ofparticle.		
Mapping of Course Outcomes	CO6	

Reference Book:

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. Introduction to Mechanics — MK Verma
3. An Introduction to Mechanics — D Kleppner & R Kolenkow
4. Principles of Mechanics — JL Synge & BA Griffiths
5. Mechanics — JP Den Hartog
6. Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
7. Mechanical Vibrations — JP Den Hartog
8. Theory of Vibrations with Applications — WT Thomson

Methodology:

The course will be covered through lectures supported by practicals.

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1	PO 12
CO	1	1	2	1	-	-	-	-	-	-	-	-
CO 2	1	2	-	2	-	-	-	-	-	-	-	-
CO 3	2	1	2	1	-	-	-	-	-	-	-	-
CO 4	1	2	-	2	-	-	-	-	-	-	-	-
CO 5	-	-	2	-	-	-	-	-	-	-	-	-
CO 6	-	2	1	2	-	-	-	-	-	-	-	-
Co7	1	2	2	-	-	-	-	-	-	-	-	-

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BT 203: Engineering Mechanics

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	03	Internal Assessment (TH): 40 Marks End Semester (TH): 60 Marks

Course Objective:

The objective of the course is to familiarize the students with the basic conceptsof engineering mechanics.

Course Outcomes:

CO1: At the end of the course the students will have sufficient knowledge ofmechanical engineering techniques which will help them to implement them in the life sciences.

CO2: Principle of statics, Force system, Resolution and composition of forces, Resultant of concurrent, forces.

CO3: Types of beams, simple and compound beams, Type of supports andreaction.

CO4: Understand Simple Contact friction, Rolling Resistance & Belt Friction

CO5: Basic Concepts Equation of motion in Cartesian coordinates.

CO6: understand the kinetics Work, power, and energy conservative.

Prerequisites:

Since the course is technical in nature the students must have the basicknowledge of Math sans Physics.

Unit I	**Module 1**	**(06 Hours)**
Introduction, Units and Dimensions, Laws of Mechanics, Vectors – Victorian representationof forces and moments, Vector operations		
Mapping of Course Outcomes	CO1	
Unit II	**Module 2**	**(08 Hours)**
Principle of statics, Force system, Resolution and composition of forces, Resultant of concurrent, forces. Moment of a force, Varignon's theorem, resultant of parallel forcesystem, Couple, Equivalent force couple system, Resultant of parallel general force system		
Mapping of Course Outcomes	CO2	
Unit III	**Module 3**	**(08 Hours)**
Free body diagram Equilibrium of concurrent, parallel forces in a plane Equilibrium of general forces in a plane Equilibrium of three forces in a plane, Types of beams, simple and compound beams, Type of supports andreaction, Forces in space, Resultant of concurrent and parallel forces in a space, Equilibrium of concurrent and parallel forces in a space.		
Mapping of Course Outcomes	CO3	
Unit IV	**Module 4**	**(04 Hours)**
Frictional Force, Laws of Coulomb friction, Simple Contact friction, Rolling Resistance & Belt Friction		

Mapping of Course Outcomes	CO4

Unit V	**Module 5**	**(07 Hours)**
Kinematics of linear motion- Basic concepts Equation of motion for constant acceleration Motion under gravity, Variable accelerationmotion curves. Kinematics of curvilinear motion- Basic Concepts Equation of motion inCartesian coordinates Equation of motion in path coordinates Equation of motion in polar coordinates Motion of projectile.		
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Module 6**	**(07 Hours)**
Kinetics- Newton‘s Second Law of motion Application of Newton‘s Second Law. Work, power, energy, conservative and non- conservative forces Conservation of energy formotion of particle, Impulse, Momentum, Direct central impact. Coefficient of restitution, Impulse Momentum principle ofparticle.		
Mapping of Course Outcomes	CO6	

Reference Book:

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. Introduction to Mechanics — MK Verma
3. An Introduction to Mechanics — D Kleppner & R Kolenkow
4. Principles of Mechanics — JL Synge & BA Griffiths
5. Mechanics — JP Den Hartog
6. Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
7. Mechanical Vibrations — JP Den Hartog
8. Theory of Vibrations with Applications — WT Thomson

Methodology:

The course will be covered through lectures supported by practicals.

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1	PO 12
CO	1	1	2	1	-	-	-	-	-	-	-	-
CO 2	1	2	-	2	-	-	-	-	-	-	-	-
CO 3	2	1	2	1	-	-	-	-	-	-	-	-
CO 4	1	2	-	2	-	-	-	-	-	-	-	-
CO 5	-	-	2	-	-	-	-	-	-	-	-	-
CO 6	-	2	1	2	-	-	-	-	-	-	-	-
Co7	1	2	2	-	-	-	-	-	-	-	-	-

Dr. D. Y. Patil School of Science &Technology,
Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune
ESC 204: Project Based Learning -I

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Practical: 04 Hours/Week	02	Internal Assessment (TH): 40 Marks End Semester (TH): 60 Marks

Course Objective

1. To emphasizes learning activities that are long-term, interdisciplinary andstudent-centric.
2. To inculcate independent learning by problem solving with social context.
3. To engages students in rich and authentic learning experiences.
4. To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

Course Outcomes:

CO1: Project based learning will increase their capacity and learning through shared cognition.

CO2: Students able to draw on lessons from several disciplines and apply them in practical way.

CO3: Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

Group Structure:

Working in supervisor/mentor –monitored groups. The students plan, manageand complete a task/project/activity which addresses the stated problem.

- There should be team/group of 5 -6 students
- A supervisor/mentor teacher assigned to individual groups

Selection of Project/Problem:

The problem-based project-oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a questionor ―wondering. This formulated problem then stands as the starting point forlearning. Students design and analyze the problem within an articulated interdisciplinary or subject frame.

A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific and grows out of students ‘wondering within different disciplines and professional environments. A chosen problem has to be exemplary. The problem may involve an interdisciplinary approach in both theanalysis and solving phases.

By exemplarity, a problem needs to refer back to a particular practical,scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry.

There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarityof the learning goals, the content and structure of the activity.

- A few hands-on activities that may or may not be multidisciplinary
- Use of technology in meaningful ways to help them investigate,collaborate, analyze, synthesize and present their learning.
- Activities may include- Solving real life problem, investigation /studyand Writing reports of in depth study, field work.

The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness.

Progress of PBL is monitored regularly on weekly basis. Weekly review of thework is necessary. During process of monitoring and continuous assessment AND evaluation the individual and team performance is to be measured. PBLis monitored and continuous assessment is done by supervisor /mentor and authorities.

Students must maintain an institutional culture of authentic collaboration, self-motivation, peer-learning and personal responsibility. The institution/ department should support students in this regard through guidance/orientationprograms and the provision of appropriate resources and services. Supervisor/mentor and Students must actively participate in assessment and evaluation processes.

Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.

- Individual assessment for each student (Understanding individual capacity, role and involvement in the project) Group assessment (rolesdefined, distribution of work, intra-team communication and togetherness) Documentation and presentation Evaluation and Continuous Assessment:

It is recommended that the all activities are to be record and regularly, regularassessment of work to be done and proper documents are to be maintained at college end by both students as well as mentor (you may call it PBL work book).

Continuous Assessment Sheet (CAS) is to be maintained by all mentors/department and institutes

- Recommended parameters for assessment, evaluation and weightage:Idea Inception **(5%)**
- Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product **(50%)** (Individual assessment and team assessment)
- Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) **(25%)**
- Demonstration (Presentation, User Interface, Usability etc) **(10%)**
- Contest Participation/ publication **(5%)**
- Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects **(5%)**

PBL workbook will serve the purpose and facilitate the job of students,mentor and project coordinator. This workbook will reflect accountability,punctuality, technical writing ability and work flow of the work undertaken.

Reference Book:

- Project-Based Learning, Edutopia, March 14, 2016. What is PBL?Buck Institute for Education.
- www.schoology.com
- www.wikipedia.org
- www.howstuffworks.com

@The CO-PO Mapping Matrix

SEMESTER - III

SEMESTER III						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
ESC-CS-301	Data Science	1	0	2	3	**2**
ESC-CS 302	Web Technology	2	1	2	5	**4**
ESC-CS 303	Object Oriented Programming	2	1	2	5	**4**
ESC-CS 304	Database Management System	2	1	2	5	**4**
PCC-CS 301	Engineering Design & Innovation-I	0	0	12	12	**6**
PCC-CS 302	Design Thinking -I	2	1	2	5	**3**
PEC-CS 301	Skill Enhancement Course-I	1	0	0	1	**1**
Total		**10**	**4**	**22**	**36**	**24**

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ESC-CS-301: Data Science

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	**02**	**Internal Assessment (TH): 40** End Semester (TH): 60

Prerequisites: Student should have a fundamental understanding of Fundamentals of Programming Languages (C, C++, and Java & Python) and a strong mathematical foundation.

Course Objectives:

1. To understand the fundamentals of data science
2. To learn various data pre-processing and data collection techniques
3. To understand the process of data analytics and model building
4. To understand different tools and techniques of data visualization

Course Outcomes:

After completion of the course, learners should be able to
CO1. To understand the concept of data science and data science life cycle
CO2. To apply the pre-processing techniques for generating quality data inputs
CO3. To analyze the concept and parameters of exploratory data analytics
CO4. To develop the regression models using data science and analytics process
CO5. To analyze various tools and techniques of data visualization
CO6. To apply validation of data with specific parameters

Course Contents

Unit I	**Introduction**	**(06 Hours)**
Evolution of Data Science, Introduction to Data Science – Types of Data, Data Science Vs Big Data, Concept of Big Data, Concept of Data Warehousing, Introduction to Data Mining, Role of Data Scientist, Data Science Life Cycle, Data Science Roles – Data Science Project Stages – Data Science Applications in Various Fields – Data Security Issues, thinking in a structured way to solve data science problem statements.		
Mapping of Course Outcomes	CO1	
Unit II	**Pre-processing & collection of data**	**(06 Hours)**
Need of Data Pre-processing-processing of data and data collection, Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization, Data Storage, and management, Data preparation with Sandbox for analytics		
Mapping of Course Outcomes	CO2	

Unit III	**Exploratory Data Analytics**	**(06 Hours)**

Introduction to Data Analytics/Concept of Data Analytics Types of Data Analytics, Descriptive Statistics, Mean, Standard Deviation, Skewness, and Kurtosis, Box Plots, Pivot Table, Heat Map, Correlation Statistics, ANOVA, Exploratory Data Analytics, Confidence (statistical) intervals; variances and correlations		
Mapping of Course Outcomes	CO3	
Unit IV	**Regression & Model Development**	**(06 Hours)**
Simple and Linear Regression – Visual Model Evaluation – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – In-sample Evaluation Measures – Prediction and Decision Making		
Mapping of Course Outcomes	CO4	
Unit V	**Model Evaluation Generalization**	**(06 Hours)**
Metrics for Out-of-Sample Evaluation Error – Cross Validation – Overfitting – Under fitting and Model Selection – Ridge Regression Prediction – Grid Search Testing Multiple Parameters		
Mapping of Course Outcomes	CO6	
Unit VI	**Data Visualization**	**(05 Hours)**
Data handling /Data wrangling using Python Definition, Types of visualization, data visualization, Data types, Data encoding, mapping variables, Conventional data visualization tools, Techniques for visual data representations, Types of data visualization		
Mapping of Course Outcomes	CO5	

List of Practical

1. Determine the need for data science and use Python's built-in data types and techniques to tackle basic challenges.
2. Using the OOP paradigm, create an application with user-defined modules and packages. Install, configure and run Hadoop and HDFS
3. Use NumPy arrays for efficient storage and data operations.
4. Use Python Data Structures, Intrinsic NumPy objects, and Random Functions to create NumPy arrays.
5. NumPy array manipulation (indexing, slicing, reshaping, joining, and splitting).
6. Using Universal Functions and Mathematical Methods to compute on NumPy arrays
7. Import any CSV file into a Pandas Data Frame and run the following commands:

a. Visualize the first and last 10 records
b. Determine the shape, index, and column details
c. Select/Delete records (rows)/columns based on circumstances

Learning Resources

Reference Books:

1. G. Strang. Introduction to Linear Algebra, Wellesley-Cambridge Press, Fifth edition, USA, 2016.
2. Bendat, J. S. and A. G. Piersol. Random Data: Analysis and Measurement Procedures. 4th Edition. John Wiley & Sons, Inc., NY, USA, 2010
3. Montgomery, D. C. and G. C. Runger. Applied Statistics and Probability for Engineers. 5th Edition. John Wiley & Sons, Inc., NY, USA, 2011.
4. David G. Luenberger. Optimization by Vector Space Methods, John Wiley & Sons (NY), 1969.
5. Cathy O'Neil and Rachel Schutt. Doing Data Science, O'Reilly Media, 2013.
6. Jojo Moolayil, "Smarter Decisions: The Intersection of IoT and Data Science", PACKT, 2016.
7. Cathy O'Neil and Rachel Schutt, "Doing Data Science", O'Reilly, 2015.
8. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2	1	2	_	2	_	_	_	_	_	_	_	_
CO3	2	1	2	1	_	_	_	_	_	_	_	_
CO4	1	2	_	2	_	_	_	_	_	_	_	_
CO5	-	_	2	_	_	_	_	_	_	_	_	_
CO6	-	2	1	2	_	_	_	_	_	_	_	_

Dr D. Y. Patil School of Science &Technology,
Dr D. Y. Patil Vidyapeeth, Pimpri, Pune

ESC-CS-302: Web Technology

Teaching Scheme and Marks | Credit Scheme | Examination Scheme

Lecture: 02 Hours/Week **04**
Internal Assessment (TH): 40 Marks
End Semester (TH): 60 Marks

Prerequisites: Basic knowledge of Data Structures and Algorithms, Discrete Mathematics is required.

Course Objectives:

1. Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
2. Write backend code in PHP language and Writing optimized frontend code HTML and JavaScript
3. Understand, create and debug database related queries and Create test code to validate the applications again client requirement
4. Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution

Course Outcomes:

Upon successful completion of this course, students will be able to:

CO1. Understand server-side scripting with PHP language

CO2. Understand what XML is and how to parse and use XML Data with Java

CO3. Understand life Cycle of Servlet

CO4. To introduce Server-side programming with Java Servlets and JSP

CO5. Gain knowledge of client-side scripting, validation of forms and AJAX programming

Course Contents

Unit I	**Introduction to PHP**	**(08 Hours)**
Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies. File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.		
Mapping of Course Outcomes	CO1	
Unit II	**HTML Common tags**	**(08 Hours)**

HTML Common tags-List, Tables, images, forms, Frames; Cascading Style sheets; XML:Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.		
Mapping of Course Outcomes	CO2	
Unit III	**Introduction to Servlets**	**(08 Hours)**
Common Gateway Interface (CGt), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.		
Mapping of Course Outcomes	CO3	
Unit IV	**Introduction to JSP**	**(08 Hours)**
The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.		
Mapping of Course Outcomes	**CO4**	
Unit V	**Client-side Scripting**	**(08 Hours)**
Introduction to JavaScript, JavaScript language – declaring variables, scope of variables, functions. event handlers (onclick, on submit etc.), Document Object Model, Form validation.		
Mapping of Course Outcomes	CO5	

List of Practical

1. Design the following static web pages required for an online bookstore website.
1) HOME PAGE: The static home page must contain three frames
2) LOGIN PAGE
3) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available on the website in a table.
4) REGISTRATION PAGE
2. Write JavaScript to validate the following fields of the Registration page.
a) First Name (Name should contain alphabets and the length should not be less than 6 characters).
b) Password (Password should not be less than 6 characters length).
c) E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
d) Mobile Number (Phone number should contain 10 digits only).
e) Last Name and Address (should not be Empty).
3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS.
4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:

a) Input: Click on Display Date button using onclick () function Output: Display date in the textbox
b) Input: A number n obtained using prompt Output: Factorial of n number using alert
c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alert
d) Input: A number n obtained using prompt and add another number using confirm Output: Sum of the entire n numbers using alert

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
7. Develop and demonstrate PHP Script for the following problems:

a) Write a PHP Script to find out the Sum of the Individual Digits.
b) Write a PHP Script to check whether the given number is Palindrome or not.

8. Create an XML document that contains 10 user's information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.
9. Implement web applications using (a) PHP, (b) Servlets and (c) JSP.

Learning Resources

Text Books:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

Reference Books:

1. Web Programming, building internet applications, Chris Bates 2″ edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Java Script, D. Flanagan
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming world wide web, R.W. Sebesta, Fourth Edition, Pearson.
6. Internet and World Wide Web — How to program. Dietel and Nieto, Pearson.

@The CO-PO Mapping Matrix

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CO2	1	2		2								
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CO4	1	2	_	2	_	_	_	_	_	_	_	_
CO5	-	_	2	_	_	_	_	_	_	_	_	_

Dr. D. Y. Patil School of Science &Technology,
Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

ESC-CS-303: Object Oriented Programming

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	**04**	**Internal Assessment (TH): 40 Marks**
		End_Semester (TH): 60 Marks

Prerequisites: Basic knowledge of Data Structures and Algorithms, Discrete Mathematics is required.

Course Objectives:

1. To understand the basic concepts and fundamentals of platform independent object-oriented language.
2. To demonstrate skills in writing programs using exception handling techniques and multithreading.
3. To understand streams and efficient user interface design techniques.

Course Outcomes:

Upon successful completion of this course, students will be able to:

CO1. Use the syntax and semantics of java programming language and basic concepts of OOP.

CO2. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.

CO3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

CO4. Design event driven GUI and web related applications which mimic the real word scenarios.

CO5. Understand MVC architecture with its implementation

Course Contents

Unit I	**Introduction to Database Object Oriented Thinking and Java Basics**	**(08 Hours)**
Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class		
Mapping of Course Outcomes	CO1	
Unit II	**Inheritance, Packages and Interfaces**	**(08 Hours)**
Inheritance, Packages and Interfaces:		

Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes, The Object Class.

Defining, Creating and Accessing a Package, Understanding Class path, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.

Mapping of Course Outcomes	CO2

Unit III	**Exception Handling and Multithreading**	**(08 Hours)**

Exception Handling and Multithreading:

Concepts of Exception Handling, Benefits of Exception Handling, Termination or Presumptive Models, Exception Hierarchy, Usage of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes.

String Handling, Exploring Java.Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Interthread Communication, Thread Groups, Daemon Threads.

Enumerations, Autoboxing, Annotations, Generics.

Mapping of Course Outcomes	CO3

Unit IV	**Event Handling**	**(08 Hours)**

Event Handling:

Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes.

The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scroll pane, Dialogs, Menu bar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.

Mapping of Course Outcomes	CO4

Unit V	**Applets**	**(08 Hours)**

Applets:

Concepts of Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets.

Swing:

Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- Applet, Jframe and Jcomponent, Icons and Labels, Text Fields, Buttons – The Jbutton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

Mapping of Course Outcomes	CO5

List of Practical

1. Write a java program to find the Fibonacci series using recursive and non-recursive functions
2. Write a java program to multiply two given matrices
3. Write a java program for Method overloading and Constructor overloading
4. Write a java program to display the employee details using Scanner class
5. Write a java program that checks whether a given string is palindrome or not
6. Write a java program to represent Abstract class with example. Write a java program to implement Interface using extends keyword.
7. Write a java program to create inner classes. Write a java program to create user defined package
8. Write a java program for creating multiple catch blocks. Write a java program for producer and consumer problem using Threads
9. Write a Java program that implements a multi-thread application that has three threads.
10. Write a java program to display File class properties. Write a java program to represent the ArrayList class. Write a Java program loads phone no, name from a text file using hash table
11. Write an applet program that displays a simple message
12. Write a Java program compute factorial value using Applet. Write a program for passing parameters using Applet

Learning Resources

Text Books:

1. Java the Complete Reference, 7th Edition, Herbert Schildt, TMH.
2. Understanding OOP with Java Updated Edition, T. Budd, Pearson Education.

Reference Books:

1. An Introduction to Programming and OO Design using Java, J. Nino and F.A. Hosch, John Wiley & Sons.
2. An Introduction to OOP, Third Edition, T. Budd, Pearson Education.
3. Introduction to Java Programming, Y. Daniel Liang, Pearson Education.
4. An Introduction to Java Programming and Object-Oriented Application Development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, eighth Edition, Pearson Education

@The CO-PO Mapping Matrix

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CO2	1	2	_	2	_	_	_	_	_	_	_	_
CO3	2	1	2	1								
CO4	1	2	_	2	_	_	_	_	_	_	_	_

CO5	-	_	2	_	_	_	_	_	_	_	_	_

Dr D. Y. Patil School of Science &Technology,
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ESC-CS-304: Database Management Systems

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	**04**	**Internal Assessment (TH): 40**
		End_Semester(TH): 60 Marks

Prerequisites: Basic knowledge of Data Structures and Algorithms, Discrete Mathematics is required.

Course Objectives:

1. To understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation
2. To provide a strong formal foundation in database concepts, technology and practice
3. To give systematic database design approaches covering conceptual design, logical design and an overview of physical design Be familiar with the basic issues of transaction processing and concurrency control
4. To learn and understand various Database Security, Architectures and Applications
5. To learn a powerful, flexible and scalable general-purpose database to handle big data.

Course Outcomes:

Upon successful completion of this course, students will be able to:

CO1. Demonstrate E-R Model for given requirements and convert the same into database tables using suitable SQL and PL/SQL Command
CO2. Understand Relational Database Operability
CO3. Apply database normalization techniques for relational database design
CO4. Explain transaction Management in relational database System.
CO5. Describe database threats, database security techniques & different database architecture and its application in real life.
CO6. Analyze Data Models with real live examples

Course Contents

Unit I	**Introduction to Database**	**(06 Hours)**
Introduction: Introduction to Database. Hierarchical, Network and Relational Models. Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations. Case Study: ER diagram on University Database		

Mapping of Course Outcomes	CO1	
Unit II	**Relational Language: SQL & PL/SQL**	**(06 Hours)**
Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL, DCL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. PL/SQL: concept of Stored Procedures & Functions, Cursors, Triggers, Assertions, roles and privileges, Embedded SQL, Dynamic SQL		
Mapping of Course Outcomes	CO2	
Unit III	**Relational Database Design**	**(06 Hours)**
Relational database design: Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms, Dependency preservation, Lossless design. Self-Study: Apply normalization for University Database		
Mapping of Course Outcomes	CO3	
Unit IV	**Transaction processing and Query Optimization**	**(08 Hours)**
Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms. Storage strategies: Indices, B-trees, Hashing		
Mapping of Course Outcomes	CO4	
Unit V	**Data Security**	**(06 Hours)**
Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection		
Mapping of Course Outcomes	CO5	
Unit VI	**Advances in Database Management System**	**(08 Hours)**
Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining. Introduction to NoSQL Database, Types and examples of NoSQL Database- Key value store, document store, graph, Performance, Structured verses unstructured data, Distributed Database Model, CAP theorem and BASE Properties, Comparative study of SQL and NoSQL, NoSQL Data Models, Case Study-unstructured data from social media		

Mapping of Course Outcomes	CO6

Practical List:

1. Design and Develop SQL DDL statements which demonstrate the use of SQL objects such as Table, View, Index, Sequence, Synonym.
2. Design at least 10 SQL queries for suitable database application using SQL DML statements: Insert, Select, Update, delete with operators, functions, and set operator.
3. Design at least 10 SQL queries for suitable database application using SQL DML statements: all types of Join, Sub-Query and View.
4. Write a PL/SQL block of code using parameterized Cursor, that will merge the data available in the newly created table N_RollCall with the data available in the table O_RollCall. If the data in the first table already exists in the second table then that data should be skipped.
5. Design and Develop MongoDB Queries using CRUD operations. (Use CRUD operations, SAVE method, logical operators)
6. Design and Implement any 5-query using MongoDB
7. Implement aggregation and indexing with suitable example using MongoDB.
8. Development of a 2-tier application using a suitable front end
9. Suggested Virtual Lab Assignments

(http://vlabs.iitb.ac.in/bootcamp/labs/dbms/exp8/exp/index.php)
http://vlabs.iitb.ac.in/bootcamp/labs/dbms/exp8/exp/procedure.php

Learning Resources

Text Books:

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, 3rd edition, Tata McGraw Hill, New Delhi, India
2. Elmasri Navate, Fundamentals of Database Systems, Pearson Education, India.

Reference Books:

1. 1.Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2005), Database System Concepts, 5th edition, McGraw-Hill, New Delhi, India.
2. Peter Rob, Carlos Coronel (2009), Database Systems Design, Implementation and Management, 7thedition

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CO2	1	2	_	2	_	_	_	_	_	_	_	_
CO3	2	1	2	1	_	_	_	_	_	_	_	_
CO4	1	2		2								
CO5	-	_	2	_	_	_	_	_	_	_	_	_
CO6	-	2	1	2	_	_	_	_	_	_	_	_

Dr D. Y. Patil School of Science &Technology,
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PCC-CS-301: Engineering Design & Innovation I

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	**04**	**Internal Assessment (TH): 40**
		End_Semester(TH): 60 Marks

Prerequisites: Any Programming Language

Course Objectives:

The primary objective of this project-based learning course is to develop critical thinking and problem-solving skills by exploring and proposing solutions to current computer engineering problems in the real world. This course will help students begin to identify themselves as computer engineers and prepare them for opportunities for their undergraduate studies.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Identify real world problems.
2. Analyze the problem, propose different solutions and select the best solution.
3. Prepare software requirement specification. CO4: Design the system using UML diagrams.

Tutors Role in Project Based Learning

1. The fundamentals of problem-based learning, lies with the Tutors role.
2. Tutors are not the source of solutions rather they act as the facilitator and mentor.
3. The facilitator skills of the Tutors / Teacher are central to the success of PBL.
4. Students are not used to the constructivist approach to learning, it is important that they are
5. carefully told what to expect in PBL.
6. Tutors need to explain the differences between PBL and traditional learning.
7. Tutors need to explain the principals involved and role of the students in PBL learning.

Students Role in Project Based Learning

1. Prepare students for PBL before starting the sessions.
2. Students must have the ability to initiate the task/idea. they should not be mere imitators.
3. They must learn to think.

4. Students working in PBL must be responsible for their own learning.

5. Throughout the PBL process, students have to define and analyze the problem, generate learning issues and apply what they have learned to solve the problem and act for them-selves and be free.

6. Students must quickly learn how to manage their own learning, instead of passively receiving instruction.

7. Students in PBL are actively constructing their knowledge and understanding of the situation in groups.

8. Students in PBL are expected to work in groups.

9. They have to develop interpersonal and group process skills, such as effective listening or coping creatively with conflicts.

Guidelines for Assessment

PBL requires regular mentoring by faculty throughout the semester for successful completion of the idea/project tasks selected by the students per batch. PBL is monitored and continuous assessment is done by supervisor /mentor and authorities. It is recommended that all activities should be recorded regularly, regular assessment of work needs to be done and proper documents need to be maintained at college end by both students as well as a mentor (PBL work book). PBL-I is an integral part of the PBLII. In this, the student shall complete the partial work of the Project which will consist of problem statement, literature review, SRS, Model and Design. The student is expected to complete the project at least up to the design phase. As a part of the progress report of PBl-I, the candidate shall deliver a presentation on the advancement in Technology pertaining to the selected project topic. The student shall submit the duly certified progress report of the project in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute. Project Exam will be conducted at the end of the semester.

PBL Project Assignments

1 Identify domain of interest and form a team of 3 to 4 members
2 Identify and present any two problem statements addressing real life problems/innovative idea.
3 Identify different alternative solutions, select the best solution and perform a feasibility study for the problem.
4 Prepare a synopsis for the proposed system.
5 Design different UML diagrams for the proposed system.

Learning Resources

Text Books:

T1. A new model of problem-based learning. By Terry Barrett. All Ireland Society for higher education (AISHE). ISBN:978-0-9935254-6-9; 2017

T2. Problem Based Learning. By Mahnazmoallem, Woei Hung and Nada Dabbagh, Wiley Publishers. 2019.

T3. Stem Project based learning and integrated science, Technology, Engineering and mathematics approach. By Robert Capraro, Mary Margaret Capraro

T4. Hassan Gomaa, “Software Modeling and Design- UML, Use cases, Patterns and Software Architectures” Cambridge University Press, 2011, ISBN 978-0-521-76414-8.

Reference Books:

R1. De Graaff E, Kolmos A., red.: Management of change: Implementation of problem-based and project-based learning in engineering. Rotterdam: Sense Publishers. 2007.
R2. Gopalan," Project management core text book", 2 Indian Edition
R3. James Shore and Shane Warden, "The Art of Agile Development"
R4. Gardy Booch, James Rambaugh, Ivar Jacobson, "The unified modeling language user guide", Pearson Education, Second edition, 2008, ISBN 0-321-24562-8.

Dr D. Y. Patil School of Science &Technology,
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PCC-CS-302: Design Thinking I

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	**04**	**Internal Assessment (TH): 40**
		End_Semester(TH): 60 Marks

Course Objectives:

1. To learn design thinking concepts and principles
2. To learn the different phases of design thinking

Course Outcomes

After completion of the course, learners should be able to

CO1. Understand (identify) the fundamentals of Design Thinking concepts, process and Principles
CO2. Identify the methods to empathize and define the problem
CO3. Apply the ideation techniques for problem solving
CO4. Construct the prototype to evaluate a design
CO5. Identify various techniques for testing to improve the performance.
CO6. Apply the Design Thinking approach and model to real world situations

Course Contents

Unit I	**Introduction**	**(06 Hours)**
Introduction to Design Thinking, Design Thinking as a problem-solving tool, Principles of Design Thinking, Process of Design Thinking, Tools and techniques for Design Thinking process, Planning a Design Thinking project		
Mapping of Course Outcomes	CO1	
Unit II	**Empathize and Define**	**(06 Hours)**
Search field determination, Problem clarification, understanding of the problem, Problem analysis, Reformulation of the problem, Observation Phase, Empathetic design, Tips for observing, Methods for Empathetic Design, Artifact Analysis, Behavioral Mapping and Tracking, Empathy Map, Cognitive Walkthrough, Heuristic Evaluation, Point-of-View Phase, Characterization of the target group, Description of customer needs, Persona, Define- Analysis and Drawing Inferences from Research		
Mapping of Course Outcomes	CO2	
Unit III	**Idea Generation**	**(06 Hours)**
Idea generation Basic design directions, Themes of thinking, Inspiration and references,		

Brainstorming, Value, Inclusion, Sketching, presenting ideas Refinement Thinking in images, thinking in signs, Appropriation, Humor, Personification, Visual metaphors, Modification, thinking in words, Words and language, Type 'faces', thinking in shapes, thinking in proportions, Thinking in colors, Ideation tools & exercises. Storytelling and Tools for Innovation Evaluation of ideas		
Mapping of Course Outcomes	CO3	
Unit IV	**Prototype**	**(06 Hours)**
Prototype Phase - Lean Startup Method for Prototype Development, Visualization and presentation 67/94 techniques, Ideas to presentable concepts, Storyboards, Developing mock-ups, models and prototypes, Quick and Dirty Prototyping		
Mapping of Course Outcomes	CO4	
Unit V	**Testing and Implementation**	**(06 Hours)**
Test Phase – Technique for interviews and surveys, Kano Model, Desirability Testing, Presenting Prototypes, testing prototypes, obtaining feedback to refine product Usability and Ergonomic testing		
Mapping of Course Outcomes	CO5	
Unit VI	**Design Thinking and Innovation**	**(06 Hours)**
Design and Innovation as an Organizational Strategy: Design Thinking meets the corporation, Design Thinking a systematic approach to innovation, using design thinking to manage an innovation portfolio, Transforming Organization, The New Social Contract, Design Activism, Designing tomorrow		
Mapping of Course Outcomes	CO6	

List of Practicals

1. a. Draw a mind map for planning an event in the college
   b. Thirty circle Exercise ---ideation Take the Thirty Circles sheet and a pen. Draw recognizable objects in as many circles as possible. That could be a pizza, clock, apple, etc. discuss the outcome. Reference: https://www.mindmeister.com/blog/mind-map-examples/ https://innovationlab.net/blog/9-best-exercises-to-spark-creativity-in-ideation/

2. a. Draw out the Empathy map.The map is composed of 4 quadrants:
1. What I hear from others
2. What I see others doing
3. What I say and do
4. What I understand and feel Decide on the Subject and the Scope of Your Empathy Map, Collect Relevant Data, Start to Fill in the Map, Complete the Outer Sections of the Map, Complete the Center Section of the Map, Reflect on What You have Discovered, Draw Conclusions and Take Action Reference: https://www.mindtools.com/pages/article/empathy-mapping.

OR

b. Draw customer journey map for an online course website. Reference: https://visme.co/blog/customer-journey-map/

Learning Resources

Reference Books:

1.” Design Thinking”, Gavin Ambrose, Paul Harris, AVA Publishing

2. “Handbook of Design Thinking - Tips & Tools for how to design thinking”, Christian Mueller-Rotenberg.

3. “Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation” by Tim Brown

4. “Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School”, IdrisMootee, Wiley.

5. “Designing for Growth: a design thinking tool kit for managers”, Jeanne Liedtka and Tim Ogilvie

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CO5	-	_	2	_	_	_	_	_	_	_	_	_
CO6	-	2	1	2	_	_	_	_	_	_	_	_
CO7	1	2	2	_	_	_	-	-	-	-	-	-

SEMESTER - IV

SEMESTER IV						
Course Code	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
ESC-CS 401	Advanced Data Structure	2	1	2	5	4
ESC-CS 402	Discrete Structure and Automata Theory	2	1	2	5	4
ESC-CS 403	Computer Network	2	1	2	5	4
ESC-Cs 404	Data Visualization	2	1	2	5	4
PCC-CS-401	Engineering Design & Innovation-II	0	0	12	12	6
PCC-CS-402	Design Thinking -II	0	1	0	1	1
PEC-CS 401	Skill Enhancement Course-II	1	0	0	1	**1**
Total		**9**	**5**	**20**	**34**	**24**
Skill Enhancement Course-I: Object Oriented Programming - C++/JAVA Skill Enhancement Course-II: Front end development with HTML5, CSS3/ Design Framework- Django/ AnjularJS/ ReactJS						

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ESC-CS-401: Advanced Data Structures

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	**04**	**Internal Assessment (TH): 40**
		End_Semester(TH): 60 Marks

Prerequisites: Students must have knowledge of programming language, basics of mathematics and ability to solve problem. Students also must have a good command on C & Python Programming.

Course Objectives:

1. To understand the basic concepts in data structure.
2. To discuss various algorithmic strategies to solve real life problems.
3. To acquaint the learner various data searching and sorting techniques.
4. To identify and use the appropriate data structure for various real life problems using computer languages.
5. To understand the concepts of linear, non-linear data structures with its complexities.
6. To understand and efficiently apply various data structures such as stacks, queues, linked lists, trees and graphs for solving various computing problems using Python programming language.

Course Outcomes:

Upon successful completion of this course, students will be able to:

CO1. To understand the need of data structures.
CO2. To learn to apply the algorithm complexity techniques for various estimations.
CO3. To use organized data structure to solve various problem statements.
CO4. To develop the solutions to social issues using NP Complete theory using Python.
CO5. To distinguish the use of various structures in solving problems.
CO6. To understand the usage of appropriate data structures to implement algorithms.

Course Contents

Unit I	**Introduction to Data Structure and Algorithms**	**(06Hours)**
Algorithm characteristics, Algorithm design tools, pseudo code and flowchart, Asymptotic notations complexity Recursion and iteration, recurrence equation, Master's theorem recurrence relationships. Need of Data Structure, Types of Data Structure and Abstract Data types.		
Mapping of Course	CO1	

Outcomes		
Unit II	**Linear Data Structures**	**(08 Hours)**
Arrays based Linear Data Structure: Array storage, sparse arrays; Transpose, addition, and multiplication of sparse matrices, Stacks and Queues and their applications, multiple stacks, queues in an array.		
Mapping of Course Outcomes	CO2	

Unit III	**Non-Linear Data Structures**	**(08 Hours)**
Singly, Doubly & Circular Linked Lists; representation, operations, applications, linked stacks and queues. linked lists based polynomial addition		
Mapping of Course Outcomes	CO3	
Unit IV	**Advanced Data Structures**	**(08 Hours)**
Trees, Basic concepts and definitions of a tree and binary tree and associated terminology, Binary tree traversal techniques, some more operations on binary trees, Heaps, heapsort.		
Mapping of Course Outcomes	CO4	
Unit V	**Searching & Sorting Techniques**	**(08 Hours)**
Searching techniques: Linear and Binary Search techniques, Sorting techniques: Insertion, Selection, Bubble, Merge sort, Quicksort.		
Mapping of Course Outcomes	CO5	
Unit VI	**NP–Hard and NP Complete Problems**	**(08 Hours)**
Definitions, Cook's Theorem, NP complete Problems, NP Hard Scheduling problems, Case studies		
Mapping of Course Outcomes	CO6	

List of Practical

1. Write Python programs for implementing the following searching techniques. a. Linear search b. Binary search c. Fibonacci search
2. Write Python programs for implementing the following sorting techniques to arrange a list of integers in ascending order. a. Bubble sort b. Insertion sort c. Selection sort
3. Write Python programs for implementing the following sorting techniques to arrange a list of integers in ascending order. a. Quick sort b. Merge sort
4. Write Python programs to a. Design and implement Stack and its operations using List. b. Design and implement Queue and its operations using List.

5. Write Python programs for the following: a. Uses Stack operations to convert infix expression into postfix expression. b. Uses Stack operations for evaluating the postfix expression

6. Write Python programs for the following operations on Single Linked List. (i) Creation (ii) insertion (iii) deletion (iv) traversal b. To store a polynomial expression in memory using single linked list

7. Write Python programs for the following operations on Circular Linked List. (i) Creation (ii) insertion (iii) deletion (iv) traversal

8. Write Python programs for the following: Uses functions to perform the following operations on Double Linked List. (i) Creation (ii) insertion (iii) deletion (iv) traversal in both ways

9. Write a Python program to implement Stack using linked list.

10. Write a Python program to implement Linear Queue using linked list

11. Write Python programs to implement the following graph traversal algorithms: a. Depth first search. b. Breadth first search

12. Write a Python program to perform the following: a. Create a binary search tree. b. Traverse the above binary search tree recursively in pre-order, post-order and in-order. c. Count the number of nodes in the binary search tree

Learning Resources

Reference Books:

I. E Horowitz and S. Sahni: Fundamentals of Data Structures in C, Second Edition, Universities P Hyderabad.

II. R.L. Kruse: Data Structures & Program Design in C, PHI.

III. D.F. Knuth: The art of Computer Programming Vol 1, Narosa Publications, 1985.

IV. Byron S. Gottfried & J K Chhabra: Theory and Problems of Programming with C Language, Schaum's Outlines Series, TMH, 2005.

V. David Griffiths, Introduction to Electrodynamics, 3rd edition, 1999, Prentice Hall

VI. David Griffiths, Introduction to Quantum Mechanics, 2nd edition, 2005, Prentice Hall

VII. Y Daniel Liang, "Introduction to Programming using Python", Pearson.

VIII. Benjamin Baka, David Julian, "Python Data Structures and Algorithms", Packt Publishers,201

IX. Rance D. Necaise, "Data Structures and Algorithms using Python", Wiley Student Edition.

X. Martin Jones, "Python for Complete Beginners", 2015.

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2	1	2		2								
CO3	2	1	2	1								
CO4	1	2		2								
CO5	-		2									
CO6	-	2	1	2								

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ESC-CS-402: Discrete Structure and Automata Theory

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	**04**	**Internal Assessment (TH): 40**
		End_Semester(TH): 60 Marks

Prerequisites: Basic knowledge of fundamental mathematics is required.

Course Objectives:

1. To learn the fundamental concepts like set, relations, functions, graph, coding theory.
2. To understand the related operations and terminologies in context of problem by applying suitable set, function, and relation models to real instances.
3. To use simple programming statements and expressions to demonstrate different solutions/approach.
4. To understand use of set theory, graph theory, algebraic structure.
5. To formulate the problems, solve them, use formal proof techniques, and explain reasoning.
6. To learn to express algorithmic ideas mathematically.

Course Outcomes:

Upon successful completion of this course, students will be able to:
CO1. To identify set, discrete numerical functions.
CO2. Apply recursive functions and solve recurrence relations.
CO3. To understand the various properties of algebraic structures.
CO4. To apply combinatorial problems using basic computing principles.
CO5. To determine critical thinking, analytical reasoning, and problem-solving abilities.
CO6. To interpret data and solve problems, use appropriate mathematical and statistical concepts and operations.

Course Contents

Unit I	**Sets and Propositions**	**(08 Hours)**
Sets, set combinations, finite and infinite sets, countably infinite sets, inclusion and exclusion principle, multi-sets Propositions, Conditional Propositions, Logical Connectivity, Prepositional Calculus, Universal and Existential Quantifiers, Standard Forms, Proof Methods, Mathematical Induction		
Mapping of Course Outcomes	CO1	

Unit II	Relations and Functions	(07 Hours)
Binary Relationship Properties, Relationship severance Warshall's algorithm, Job scheduling problem using discrete numeric functions and generating functions. Homogeneous Solutions, Linear Recurrence Relations with Constant Coefficients, and Recurrence Relations.		
Mapping of Course Outcomes	CO2	

Unit III	Algebraic structures	(08 Hours)
The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups, and Congruence relations, Rings, Integral Domains and Fields, Graphs and their properties – Degree, Connectivity, Path, Cycle – Sub Graph –Isomorphism – Eulerian and Hamiltonian Walks –Rooted Trees, Trees and Sorting.		
Mapping of Course Outcomes	CO3	
Unit IV	**Graph Theory**	**(08 Hours)**
Basic terminology, graph representation in computer memory, multi-graphs and weighted graphs, Subgraphs, Isomorphic graphs Operations on graphs, paths and circuits, Hamiltonian and Euler paths and circuits, shortest path in weighted graphs (Dijkstra's algorithm), factors of a graph, planer graph and Traveling salesman problem, Graph Coloring		
Mapping of Course Outcomes	CO4	
Unit V	**Trees**	**(07 Hours)**
Basic terminology and characterization of trees, Prefix codes and optimal prefix codes, binary search trees, Tree traversal, spanning trees, Fundamental Trees and cut sets, Minimal Spanning trees, Kruskal's and Prim's algorithms for minimal spanning trees, The Max flowMin Cut Theorem (Transport network).		
Mapping of Course Outcomes	CO5	
Unit VI	**Coding Theory**	**(07 Hours)**
Coding theory, Polynomial Rings and polynomial Codes, Galois Theory –Field Theory and Group Theory.		
Mapping of Course Outcomes	CO6	

Learning Resources

Reference Books:

1. Kenneth H. Rosen, "**Discrete Mathematics and its Applications: with Combinatorics and Graph Theory**", 7th Edition, Tata McGraw –Hill Education Pvt. Ltd., 2015.
2. J.P. Tremblay and R. Manohar, "**Discrete Mathematical Structure with Applications to Computer Science**", Tata Mc Graw Hill Education (India) Edition 1997.
3. Norman L. Biggs, "**Discrete Mathematics**", 2nd Edition, Oxford University
4. Narsingh Deo, "**Graph theory with applications to Engineering and Computer Science**", Prentice Hall Inc., Englewood Cliffs,N.J., 1974.
5. Susanna S. Epp, "**Discrete Mathematics with Applications**", 4th edition, Brooks/Cole, Cengage Learning, 2010.

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO2	1	2	_	2	_	_	_	_	_	_	_	_
CO3	2	1	2	1								
CO4	1	2	_	2	_	_	_	_	_	_	_	_
CO5	-	_	2	_	_	_	_	_	_	_	_	_
CO6	-	2	1	2	_	_	_	_	_	_	_	_
CO7	1	2	2	_	_	_	-	-	-	-	-	-

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ESC-CS-403: Computer Networks

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	**04**	**Internal Assessment (TH): 40**
		End_Semester(TH): 60 Marks

Prerequisites: Student should have a fundamental understanding of programming and digital electronics, computer organizations.

Course Objectives:

1. To get a basic understanding of networking standards, protocols, and technology.
2. To learn various framing, error control, flow management, and routing techniques.
3. To understand the role of protocols at different layers of the protocol stack. To get knowledge in network programming.
4. To analyze the contents in the layers using simulation tools.
5. To design and implement routing algorithms.
6. Using Modern Tools, demonstrate LAN and WAN protocol behavior.
7. Using Application, Transport, and Network Layer Protocols, examine data flow between peers in an IP network.
8. Demonstrate basic switch and router configuration.

Course Outcomes:

On completion of the course, student will be able to–

CO1. To analyze the needs of a certain organizational structure, to determine the best networking architecture, topologies, transmission channels, and technologies.

CO2. To demonstrate concerns with design, flow, and error control.

CO3. To showcase various routing and switching strategies.

CO4. Analyze data flow utilizing the Application, Transport, and Network Layer Protocols in the TCP/IP paradigm.

CO5. To demonstrate how computer network capabilities, selection, and usage can be applied to various sectors of the user community.

CO6. Using appropriate standards and technology, illustrate Client-Server architectures and prototypes.

Course Contents

Unit I	**Introduction**	**(06 Hours)**
Basics of Networks: - Definition, Need, Applications, Network Topologies, BUS, STAR, MESH, Hybrid: Definition, Advantages & Disadvantages, Applications - OSI Reference Model: Diagram, Working & Significance of Each Layer.		

- Protocol Basics: Definition, Types of Protocols, Usage of Various Protocols, Networking Components (Hardware): Cables & Connectors (Coaxial, UTP/STP, Fiber Optics, Cat(x)Cables), Switches (Unmanaged, Smart Web Managed, Full Managed), Hardware/Software Firewall, Study of UTM, Wireless Routers DSL/ADSL – Latest Examples and Usage		
Mapping of Course Outcomes	CO1	
Unit II	**Physical Layer**	**(07 Hours)**
Introduction to LAN, MAN, WAN, PAN, Ad-hoc Network, Network Architectures: Client-Server, Peer-to-Peer, Distributed, and SDN, OSI Model, TCP/IP Model, OSI Model, TCP/IP Model, Star and hierarchical topologies; Layers, Transmission Mediums: CAT5, 5e, 6, OFC, and Radio Spectrum, Network Devices: Bridge, Switch, Router, and Access Point, Manchester and Differential Manchester Encodings; IEEE802.11: Frequency Hopping (FHSS) and Direct Sequence; Direct sequences (DSSS)		
Mapping of Course Outcomes	CO1	

Unit III	**Data Link Layer**	**(08 Hours)**
Services to the Network Layer, Framing, Error Control, and Flow Control are all design issues. Parity Bits, Hamming Codes (11/12-bits), and Unrestricted Simplex, Stop and Wait, and Sliding Window Protocol are examples of flow control protocols. Pure and Slotted ALOHA, CSMA, WDMA, IEEE 802.3 Standards and Frame Formats, CSMA/CD, Binary Exponential Back -off algorithm, Fast Ethernet, Gigabit Ethernet, IEEE 802.11a/b/g/n and IEEE 802.15 and IEEE 802.16 Standards, Frame formats, CSMA/CA.		
Mapping of Course Outcomes	CO2	
Unit IV	**Network Layer**	**(08 Hours)**
Switching techniques, IP Protocol, IPv4 and IPv6 addressing schemes, Subnetting, NA , CIDR, ICMP, Routing Protocols: Distance Vector, Link State, Path Vector, Routing in Internet using Graphical Network System 3, Wireshark: RIP, OSPF, BGP, Congestion control and QoS, , MPLS, Mobile IP, Routing in MANET : AODV, DSR		
Mapping of Course Outcomes	CO3	
Unit V	**Transport Layer**	**(08 Hours)**
Services, Berkley Sockets, Addressing, Connection establishment and Port Numbers, Connection release, Flow control and buffering, Multiplexing, TCP, TCP Timer management, TCP Congestion Control, Real Time Transport protocol (RTP), Stream Control Transmission Protocol (SCTP), Quality of Service (QoS), Differentiated services, TCP and UDP for Wireless.		
Mapping of Course Outcomes	CO4	
Unit VI	**Application**	**(08 Hours)**

	Layer	
Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Email: SMTP, MIME, POP3, Webmail, FTP, TELNET, Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP).		

CO\ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2	1	2	_	2	_	_	_	_	_	_	_	_
CO3	2	1	2	1								
CO4	1	2	_	2	_	_	_	_	_	_	_	_
CO5	-	_	2	_	_	_	_	_	_	_	_	_
CO6	-	2	1	2	_	_	_	_	_	_	_	_

Mapping of Course Outcomes	CO5,CO6

List of Practical

1. Create a point-to-point network with three nodes and duplex links between them. Set the queue size, change the bandwidth, and count how many packets are dropped.
2. Send ping messages/trace routes over a network with six nodes and count the number of packets lost due to congestion.
3. Create an Ethernet LAN with n nodes, various traffic nodes, and a congestion window for each source and destination.
4. Simulate the implementation of a simple ESS and transmitting nodes in a wire-free LAN and determine the performance in terms of packet transfer.
5. Test GSM performance on NS2/NS3 (using the MAC layer) or an analogous environment.
6. Implement CDMA on NS2/NS3 and examine its performance
7. Using CRC-CCITT, write a software to detect errors in code (16- bits).
8. Using the bellman-ford technique, create a software to discover the shortest path between vertices.
9. Create a client-server software that instructs the client to send the file name and instructs the server to return the contents of the requested file if it exists, using TCP/IP sockets.

Learning Resources

Reference Books:

1. Andrew S. Tenenbaum, “Computer Networks”, PHI, ISBN 81-203-2175-8.
2. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408
3. Kurose, Ross “Computer Networking a Top-Down Approach Featuring the Internet”, Pearson, ISBN-10: 0132856204 2.
4. Matthew S. G, “802.11 Wireless Networks”, O’Reilly publications, ISBN: 81-7656-992-5
5. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols” Prentice Hall, ISBN-10: 8131706885; ISBN-13: 978-8131706886
6. Holger Karl and Andreas Willing, “Protocols and Architectures for Wireless Sensor Networks”, Wiley India, ISBN: 9788126533695 5. Eldad Perahia, Robert Stacey, “Next Generation Wireless LANs”, Cambridge, ISBN-10: 1107016762; ISBN-13: 978-1107016767

@The CO-PO Mapping Matrix

10. Create a client/server datagram socket programme that displays messages typed on the server side on the client side (use Cisco Packet Tracer / NS-3, any other).

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ESC-CS-404: Data Visualization

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	**04**	**Internal Assessment (TH): 40**
		End_Semester(TH): 60 Marks

Prerequisites: Machine Learning, Computational Statistics, Statistical Methods, Introduction to Probability statistics and Calculus.

Course Objectives:

1. To study data exploration techniques.
2. To study different data visualization techniques and tools.
3. To map element of visualization well to perceive information.
4. To describe and use all the tools and libraries of python for data science

Course Outcomes:

On completion of the course, student will be able to–

CO1. Evaluate machine learning models.
CO2. Explain basics of data science.
CO3. Apply different data visualization techniques to understand the data.
CO4. Model multidimensional data and visualize it using appropriate tool.

CO5. Analyze the data using a suitable method to visualize the specific problem.
CO6. Apply visualization Models using the open source tool.

Course Contents

Unit I	**Evaluating Machine Learning Models**	**(08 Hours)**
The Machine Learning Workflow, Classification Metrics, Ranking Metrics, Regression Metrics, Offline Evaluation Mechanisms: Hold-Out Validation, Cross Validation and Bootstrapping, Hyperparameter Tuning: Model Parameters Versus Hyperparameters, Hyperparameter Tuning Mechanism, Hyperparameter Tuning Algorithms, The Case for Nested Cross-Validation, The Pitfalls of A/B Testing.		
Mapping of Course Outcomes	CO1	
Unit II	**Introduction to Data Science**	**(08 Hours)**
Defining Data Science and Big Data, Recognizing Different Types of Data, Gaining Insight Into Data Science Process, Data Science Process: Overview, Different Steps, Machine Learning Definition and Relation with Data Science		
Mapping of Course Outcomes	CO2	

Unit III	**Basics of Data Visualization**	**(08 Hours)**
Introduction to Data Visualization, Challenges of Data Visualization, Definition and Types of Dashboard, Evolution of Dashboard, Dashboard Design and Principles, Display Media for Dashboard, Types of Data Visualization: Basic Charts Scatter Plots, Histogram, Advanced Visualization Techniques Like Streamline and Statistical Measures, Plots, Graphs, Networks, Hierarchies, Reports.		
Mapping of Course Outcomes	CO3	
Unit IV	**Principles of Data Visualization**	**(08 Hours)**
The Seven Stages of Visualizing Data: Why Data Display Requires Planning, Iteration and Combination, Principles, Getting Started with Processing: Sketching with Processing, Exporting and Distributing Your Work, Examples and Reference, Functions, Sketching and Scripting, Mapping: Drawing a Map, Locations on a Map, Data on a Map Using Your Own Data.		
Mapping of Course Outcomes	CO4	
Unit V	**Data visualization of multidimensional data**	**(08Hours)**
Need of Data Modeling, Multidimensional Data Models, Mapping of High Dimensional Data Into Suitable Visualization Method-Principal Component Analysis, Clustering Study of High Dimensional Data, Visualization Tools		

Mapping of Course Outcomes	CO5	
Unit VI	**Data Analysing and Visualization using python**	**(08 Hours)**
Data Analysis Libraries: Will Learn to Use Pandas Dataframes, Numpy Multi-Dimentional Arrays, and Scipy Libraries to Work with a Various Dataset, Pandas, An Open-Source Library: Load, Manipulate, Analyze and Visualize Various Datasets. Matplotlib, Scikit-Learn, Use of Scikit-Learn Machine Learning Algorithms to Build Smart Models and Make Predictions, Parameters for Comparison		
Mapping of Course Outcomes	CO6	

List of Practical

1. To study data science and machine learning basics.
2. Access an open source dataset "Titanic". Apply pre-processing techniques on the raw dataset.
3. Build training and testing dataset of assignment 1 to predict the probability of a survival of a person based on gender, age and passenger-class.
4. Use Netflix Movies and TV Shows dataset from Kaggle and perform the following operation:

a. Make a visualization showing the total number of movies watched by children
b. Make a visualization showing the total number of standup comedies
c. Make a visualization showing most watched shows
d. Make a visualization showing highest rated show make a dashboard (DASHBOARD A) containing all of these above visualizations.

5. Explore New York City -311 Complaints and Housing datasets.
6. Analyze and visualize data using Python.
7. Perform feature engineering exercise using Python.
8. Build and validate predictive machine learning model using Python.

Learning Resources

Reference Books:

1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques" , 3rd Edition.
2. Joel Grus, " Data Science from Scratch", O'Reilly Media Inc., ISBN: 97814919014273.
3. Colin Ware, "Information Visualization Perception for Design", MK Publication.
4. Kyran Dale, "Data Visualization with Python and JavaScript", Shroff Publisher/O'Reilly Publisher Publication.
5. Alice Zheng- Evaluating Machine Learning Models: A Beginner's Guide to Key Concepts and Pitfalls, O'Reilly Media, 2015, ISBN 1491932465, 9781491932469.
6. Big data black book, Dream Tech Publication.
7. Ben Fry- Visualizing Data. Released December 2007. Publisher(s): O'Reilly Media, Inc. ISBN: 9780596514556.
8. Data Science Using Python and R by Chantal D. Larose and Daniel T. Larose, Wiley Publication.
9. Python for Data Science and Visualization -Beginners to Pro, Udemy

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2	1	2	_	2	_	_	_	_	_	_	_	_
CO3	2	1	2	1								
CO4	1	2	_	2	_	_	_	_	_	_	_	_
CO5	-	_	2	_	_	_	_	_	_	_	_	_
CO6	-	2	1	2	_	_	_	_	_	_	_	_

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PCC-CS-401: Engineering Design & Innovation II

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	**04**	**Internal Assessment (TH): 40**
		End_Semester(TH): 60 Marks

Prerequisites: Any Programming Language

Course Objectives:

1. The primary objective of this course is to develop critical thinking and problem-solving skills by exploring and proposing solutions to current computer engineering problems in the real world.
2. This course will help students begin to identify themselves as computer engineers and prepare them for opportunities for their undergraduate studies.
3. Uncovering opportunities for innovation Building a business model to extract maximum value from your ideas protecting intellectual property financing new ventures.

Course Outcomes:

Upon successful completion of this course, students will be able to:

CO1. Understand different perspectives on why creativity matters

CO2. Appreciate how organisational factors such as culture, leadership, diversity and structure can both help and hinder creativity and innovation

CO3. Apply recognized financial planning principles and industry standards to the systematic analysis of financial position and requirements.

CO4. Integrate ethical decision-making processes into all aspects of financial planning profession.

CO5. Identify criteria's to fit one's own intellectual work in particular form of IPRs

CO6. Analyze rights and responsibilities of holder of Patent, Copyright, Trademark, Industrial Design. Compare various types of IPR to protect competitive advantage.

Course Contents

Unit I	**Innovation: What and Why?**	**(04 Hours)**
The Complexity of Cognition, Relationship between brain activity and cognition, Psychometric Test(IQ and BIG Five),Reaction time(RT), mental Rotation, Neurons, Neuronal communication, Neuron Information processing		
Mapping of Course Outcomes	CO1	
Unit II	**Building an Innovative Organization**	**(04 Hours)**
Creating new products, a service, exploiting open innovation and collaboration, use of innovation for starting a new venture Class Discussion- Innovation: Co-operating across networks vs. 'go-it-alone' approach.		
Mapping of Course Outcomes	CO2	

Unit III	Entrepreneurship	(04 Hours)
Opportunity recognition and entry strategies, Entrepreneurship as a Style of Management Maintaining Competitive Advantage- Use of IPR to protect Innovation		
Mapping of Course Outcomes	CO3	
Unit IV	**Entrepreneurship- Financial Planning**	**(04 Hours)**
Financial Projections and Valuation, Stages of financing, Debt, Venture Capital and other forms of Financing		
Mapping of Course Outcomes	CO4	
Unit V	**Intellectual Property Rights (IPR)**	**(04Hours)**
Introduction and the economics behind development of IPR: Business Perspective, IPR in India – Genesis and Development, International Context, Concept of IP Management, Use in marketing.		
Mapping of Course Outcomes	CO5	
Unit VI	**Types of Intellectual Property**	**(04 Hours)**
Patent- Procedure, Licensing and Assignment, Infringement and Penalty, Trademark- Use in marketing, example of trademarks- Domain name, Geographical Indications- What is GI, Why protect them? Copyright- What is copyright, Industrial Designs- What is design? How to protect? Class Discussion- Major Court battles regarding violation of patents between corporate companies.		
Mapping of Course Outcomes	CO6	

Tutor's Role

1. The fundamentals of problem-based learning, lies with the Tutors role.
2. Tutors are not the source of solutions rather they act as the facilitator and mentor.
3. The facilitator skills of the Tutors / Teacher are central to the success of PBL.
4. Students are not used to the constructivist approach to learning, it is important that they are carefully told what to expect in PBL.
5. Tutors need to explain the differences between PBL and traditional learning.
6. Tutors need to explain the principals involved and role of the students in PBL learning

Students Role in Project Based Learning

1. Prepare students for PBL before starting the sessions.
2. Students must have the ability to initiate the task/idea. they should not be mere imitators.

Learning Resources

Text Book:

1. A new model of problem-based learning. By Terry Barrett. All Ireland Society for higher education (AISHE). ISBN:978-0-9935254-6-9; 2017
2. Problem Based Learning. By Mahnazmoallem, woe hung and Nada Dabbagh, Wiley Publishers. 2019.
3. Stem Project based learning and integrated science, Technology, Engineering and mathematics approach. By Robert Capraro, Mary Margaret Capraro
4. Hassan Gomaa, "Software Modeling and Design- UML, Use cases, Patterns and Software Architectures", Cambridge University Press, 2011, ISBN 978-0-521-76414-8

Reference Books:

1. De Graaff E, Kolmos A., red.: Management of change: Implementation of problem-based and project-based learning in engineering. Rotterdam: Sense Publishers. 2007.
2. Gopalan," Project management core text book", 2 Indian Edition
3. James Shore and Shane Warden, "The Art of Agile Development"
4. Gardy Booch, James Rambaugh, Ivar Jacobson,"The unified modeling language user guide" , Pearson Education, Second edition, 2008, ISBN 0-321-24562-8

@The CO-PO Mapping Matrix

3. They must learn to think.
4. Students working in PBL must be responsible for their own learning.
5. Throughout the PBL process, students have to define and analyze the problem, generate learning issues and apply what they have learned to solve the problem and act for them-selves and be free.
6. Students must quickly learn how to manage their own learning, Instead of passively receiving instruction.
7. Students in PBL are actively constructing their knowledge and understanding of the situation in groups.
8. Students in PBL are expected to work in groups.
9. They have to develop interpersonal and group process skills, such as effective listening or coping creatively with conflicts.

CO\ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO2	1	2	_	2	_	_	_	_	_	_	_	_
CO3	2	1	2	1	_	_	_	_	_	_	_	_
CO4	1	2	_	2	_	_	_	_	_	_	_	_
CO5	-	_	2	_	_	_	_	_	_	_	_	_
CO6	-	2	1	2								
CO7	1	2	2	_	_	_	-	-	-	-	-	-

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PCC-CS-402: Design Thinking II

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 02 Hours/Week	**04**	**Internal Assessment (TH): 40**
		End_Semester(TH): 60 Marks

Prerequisites: Basic Knowledge to applicability of existing & new applications in real world.

Course Objectives:

The course titled Innovation, Business Models and Entrepreneurship is designed to give an in-depth Understanding on Various aspects of

Innovation, Creativity, evolving business models, incubation and entrepreneurship. Come up with exposure to design thinking for designing innovative products. The course is a blend of theory and practice therefore this course does not require any prerequisite and will be useful to understand innovation and its applications in different spheres of development and growth

Course Outcomes:

After completion of the course, learners should be able to

CO1.Make use of practical design thinking methods in every stage of problem with the help of method templates.
CO2. Apply design thinking to a problem in order to generate innovative and user-centric solutions.
CO3. Empathize with the end user and initiate a new working culture based on a user-centric approach.
CO4. Prototype and run usability tests for unbiased examination of the product in order to identify problem areas.
CO5. Conceive and ideate persuasive solutions using Design Thinking approach.

Course Contents

Unit I	**Introduction**	**(05 Hours)**
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.		
Mapping of Course Outcomes	CO1	
Unit II	**Design thinking**	**(05 Hours)**
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development		
Mapping of Course Outcomes	CO2	

Unit III	**Innovation**	**(05 Hours)**
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Product Design: problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications.		

Mapping of Course Outcomes	CO3	
Unit IV	**Design thinking for strategic Innovation**	**(05 Hours)**
An exercise in design thinking – implementing design thinking for better process. Implement design thinking process in various Industries. Design thinking for Startups.		
Mapping of Course Outcomes	CO4	
Unit V	**Design thinking in various sectors**	**(05 Hours)**
Case studies in Information Technology, Finance, Education, Management and Retail sector. Analyze and Prototyping, Usability testing, Organizing and interpreting results.		
Mapping of Course Outcomes	CO5	

List of Practical

Divide the class into 4 large groups. (Ensure that students stay with their respective teams)

- In each group, one team starts presenting their work in the following format:
  - Problem Area ○ Problem Statement/HMW Question
  - Insights - Personas
  - Insights - Empathy Maps
  - Insights - Customer Journey Maps
  - 30-second Elevator Pitch of their solution
- Other teams in the group assess the team on the basis of
  - Depth of research
  - Clarity of process
  - Communication
  - Feasibility of proposed solutions
  - Uniqueness of solutions

Participants must be ready with the following materials:

- Research materials and documentation of their process (interview notes, sketches,etc.)
- A clearly defined problem statement
- User Personas
- Empathy Maps
- Customer Journey Maps
- A proposed solution to the problem statement that has been developed using the mindsets, methodologies, and tools covered in the previous modules.
- A prototype of their solution

Learning Resources

Reference Books:

1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking in the Class Room by David Lee, Ulysses press

@The CO-PO Mapping Matrix

CO\ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2	1	2	_	2	_	_	_	_	_	_	_	_
CO3	2	1	2	1								
CO4	1	2	_	2	_	_	_	_	_	_	_	_
CO5	-	_	2	_	_	_	_	_	_	_	_	_
CO6	-	2	1	2	_	_	_	_	_	_	_	_
CO7	1	2	2	_	_	_	-	-	-	-	-	-