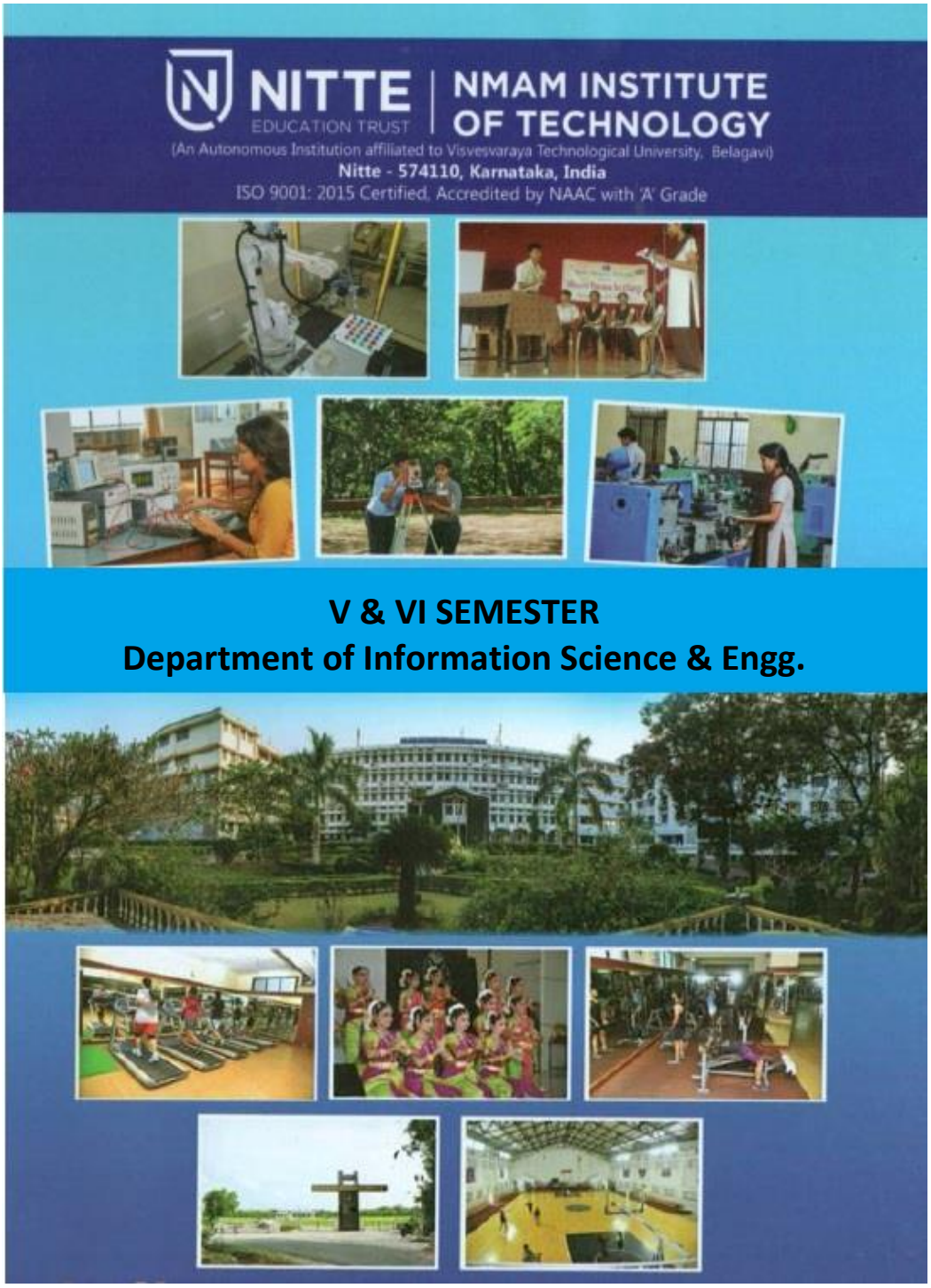
NITTE EDUCATION TRUST | NMAM INSTITUTE OF TECHNOLOGY

College Calendar 2023-24

Department of Information Science & Engineering

Syllabus of 3rd Year



College Calendar 2023-24

मातेव रक्षति पितेव हिते नियुङ्क्ते
कान्तेव चापि रमयत्यपनीय खेदम् ।
लक्ष्मीं तनोति वितनोति च दिक्षु कीर्तिं
किं किं न साधयति कल्पलतेव विद्या ॥

ಮಾತೇವ ರಕ್ಷತಿ ಪಿತೇವ ಹಿತೇ ನಿಯುಂಕ್ತೇ
ಕಾಂತೇವ ಚಾಪಿ ರಮಯತ್ಯಪನೀಯ ಖೇದಮ್ ।
ಲಕ್ಷ್ಮೀಂ ತನೋತಿ ವಿತನೋತಿ ಚ ದಿಕ್ಷು ಕೀರ್ತಿಂ
ಕಿಂ ಕಿಂ ನ ಸಾಧಯತಿ ಕಲ್ಪಲತೇವ ವಿದ್ಯಾ ॥

ತಾಯಿಯಂತೆ ರಕ್ಷಣೆಯನ್ನಿತ್ತು, ತಂದೆಯಂತೆ ಸನ್ಮಾರ್ಗದಲ್ಲಿ ತೊಡಗಿಸಿ ಪತ್ನಿಯಂತೆ ದುಃಖವನ್ನು ದೂರಮಾಡಿ ಮನಕ್ಕೆ ಮುದಕೊಡುತ್ತಾ, ಸಂಪತ್ತನ್ನು ವರ್ಧಿಸಿ ದಶದಿಕ್ಕುಗಳಲ್ಲಿ ಕೀರ್ತಿಯನ್ನು ಪಸರಿಸುವ 'ವಿದ್ಯೆ', ಕಲ್ಪಲತೆಯಂತೆ ನಾವು ಬಯಸಿದ್ದನ್ನು ಕೊಡುತ್ತಾಳೆ.

विद्या माता की तरह पालन करती है, बाप के तरह हितकर मार्ग में ही ले लेता है। पत्नी की तरह हमारा दुःख दूर करता है। मन को संतोष देता है, धन देती है, दिशओं में कीर्ति फैलाती है। कल्पवल्ली की तरह वह सब कामनाये पूरी करती है।

Do you know in how many ways the 'Knowledge' serves his master? Like mother it protects, like father it teaches and guides, like wife, provides all kinds of happiness after destroying all sorrows, it brings wealth from every corner and spreads the fame in all direction. Like 'Kalpalatha' knowledge offers everything to human being whatever he wishes.

NITTE EDUCATION TRUST | NMAM INSTITUTE OF TECHNOLOGY

(An Autonomous Institution affiliated to VTU, Belgavi)

NITTE-574110, Karkala Taluk, Udupi District, Karnataka, India

ISO 9001:2015 Certified, Accredited by NAAC with "A" Grade

COLLEGE CALENDAR

2023-24

(V & VI Semester)

NITTE EDUCATION TRUST | NMAM INSTITUTE OF TECHNOLOGY

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Vision Statement

Pursuing Excellence, Empowering people, Partnering in Community Development

Mission Statement

To develop N.M.A.M. Institute of Technology, Nitte, as Centre of Excellence by imparting Quality Education to generate competent,

Skilled and Humane Manpower to face emerging Scientific, Technological,

Managerial and Social Challenges

with Credibility, Integrity, Ethics and Social Concern.

In Memorium

Late Nitte Mahalinga Adyanthaya

Our Founder

Late Justice K. S. Hegde
1909-1990

SRI N. VINAYA HEGDE

President, Nitte Education Trust
Chancellor, Nitte (Deemed to be University), Mangaluru

NITTE EDUCATION TRUST | NMAM INSTITUTE OF TECHNOLOGY

Sl.No.	Name of the Faculty	Designation
1.	Dr. N. Niranjan Chiplunkar	Principal
2.	Mr. Yogeesh Hegde	Director(CM&D)
3.	Dr. Shrinivasa Rao B. R.	Vice Principal/Controller of Examinations/Professor
4.	Dr. I. Ramesh Mithanthaya	Vice Principal / Dean (Academic)/Professor
5.	Dr. Sudesh Bekal	Dean (R&D)/Professor
6.	Dr. Rajesh Shetty K.	Dean (Admissions)/Professor
7.	Dr. Rekha Bhandarkar	Deputy Registrar of Nitte Off-campus Centre, Nitte (DU)
8.	Dr. Subrahmanya Bhat K	Deputy COE of Nitte Off-campus Centre, Nitte (DU)
9.	Dr. Nagesh Prabhu	Director(Curriculum Development) Nitte (DU)
10.	Dr. Srinath Shetty K.	Resident Engineer/Professor
11.	Dr. Narasimha Bailkeri	Dean(Student Welfare)/Professor
12.	Dr. Rajalakshmi Samaga BL	PG Coordinator/Professor

HEADS OF DEPARTMENTS

1.	Dr. Arun Kumar Bhat	HoD, Civil Engg.
2.	Dr. Jyothi Shetty	HoD, Comp. Science & Engg
3.	Dr. Ashwini B	HoD, Information Science & Engg
4.	Dr. Ujwal P	HoD, Biotechnology
5.	Dr. KVSSSS Sairam	HoD, E&C Engg.
6.	Dr. Suryanarayana K	HoD, E&E Engg.
7.	Dr. Muralidhara	HoD, Robotics & Artificial Intelligence
8.	Dr. Kumudakshi	HoD, Mathematics
9.	Dr. Shobha R. Prabhu	HoD, Physics
10.	Dr. Shivaprasad Shetty M.	HoD, Chemistry
11.	Dr. Mamatha Balipa	HoD, MCA
12.	Dr. Vishwanatha	HoD, Humanities
13.	Dr. Udaya Kumar K Shenoy	HoD, Computer & Communication Engg
14.	Dr. Sharada Uday Shenoy	HoD, Artificial Intelligence & Machine Learning
15.	Dr. Srinivas Pai P	HoD, Mechanical Engg
16.	Dr. Venugopala PS	HoD, Artificial Intelligence & Data Science
17.	Mr. Bharath G Kumar	Head, Training & Placement Cell

INCHARGE OF INSTITUTION'S RESPONSIBILITIES

1.	Dr. Shashikanth Karinka	Co-ordinator MoUs
2.	Dr. Gururaj Upadhyaya	Workshop Suptd
3.	Dr. Joy Elvine Martis	1st year Coordinator
4.	Dr. Jnaneshwar Pai Maroor	Co-ordinator Alumni
5.	Dr. Venkatesh Kamath	Assistant CoE
6.	Dr. Janardhan Nayak	Co-ordinator – Red Cross Unit
7.	Mr. Srinivas Nekkar	NCC Officer
8.	Mr. Krishnaraja Joisa	Public Relation Officer
9.	Mr. K. Sathish Nayak	Digital Media Executive
10.	Sri. Shekar Poojari	Student Welfare Officer

ENTREPRENEURSHIP DEVELOPMENT CELL

1.	Dr. Ramakrishna B	Professor/EDC- Incharge
2.	Mrs. Geetha Poojarthi	Co-ordinator

DEPARTMENT OF TRAINING & PLACEMENT

1.	Mr. Ankith S Kumar	Counsellor

DEPARTMENT OF MATHEMATICS

1.	Dr. Shashirekha B. Rai	Professor
2.	Dr. Kumudakshi	Asso. Professor/ HoD
3.	Dr. Sharad M. Hegde	Asst. Professor Gd III
4.	Dr. Vasanth K.R	Asst. Professor Gd III
5.	Dr. Ashwini Kumari	Asst. Professor Gd III
6.	Dr. Chaithra K.	Asst. Professor Gd III
7.	Dr. Prashanthi K S	Asst. Professor Gd III
8.	Dr. Girija K P	Asst. Professor Gd III
9.	Dr. Ganesh Kumar K	Asst. Professor Gd III
10.	Mrs. Ambika N.	Asst. Professor Gd I
11.	Mrs. Vinaya Acharya	Asst. Professor Gd I
12.	Mrs. Anitha D. Bayar	Asst. Professor
13.	Mrs. Bhavya K.	Asst. Professor
14.	Mrs. Bhavya. D.	Asst. Professor
15.	Mrs. Sharmila	Asst. Professor
16.	Mrs. Anjana Pai K	Asst. Professor
17.	Mrs. Soumya	Asst. Professor
18.	Mrs. Smitha G. V.	Asst. Professor

DEPARTMENT OF PHYSICS

1.	Dr. Manjunath K. B.	Professor
2.	Dr. Shobha R. Prabhu	Asso. Professor / HoD
3.	Dr. Sathyajith	Asso. Professor
4.	Dr. Raghavendra Bairy	Asso. Professor
5.	Dr. Nagaraja B.S.	Asst. Professor Gd III
6.	Dr. Shyam Prasad . K.	Asst. Professor Gd III
7.	Dr. Saritha Suvarna	Asst. Professor Gd III

DEPARTMENT OF CHEMISTRY

1.	Dr. Janardhana Nayak	Professor
2.	Dr. Ramesh Bhat	Asso. Professor
3.	Dr. Shivaprasad Shetty M.	Asso. Prof/HoD
4.	Dr. Aarti S. Bhat	Asst. Professor Gd III
5.	Dr. Subrahmanya Ishwar Bhat	Asst. Professor Gd III
6.	Dr. Sarvajith MS	Asst. Professor Gd III
7.	Dr. Ranjitha	Asst. Professor Gd III

DEPARTMENT OF HUMANITIES

1.	Dr. Ramakrishna B.	Professor
2.	Mrs. Rashmi D. Hegde	Asso. Professor
3.	Dr. Vishwanatha	Asso. Professor /HoD
4.	Dr. Jnaneshwar Pai Maroor	Asst. Professor Gd III
5.	Dr. Joy Elvine Martis	Asst. Professor Gd III
6.	Mrs. Shyla D Mendonca	Asst. Professor Gd II
7.	Ms. Sonia Lobo	Asst. Professor Gd I
8.	Ms. Akshatha Kumari J Shetty	Asst. Professor Gd I
9.	Mr. Srinivas Nekkar	Asst. Professor
10.	Mrs. Sudeeksha S. Pai	Asst. Professor
11.	Mrs. Shwetha	Asst. Professor

OFFICE SECTION HEADS

1.	Mr. Keshava Mugeraya	Sr. Suptd, Academic Section/ Purchase In -Charge
2.	Mrs. Suneetha R. Shetty	Sr. Suptd, Administrative Section
3.	Mr. Suresh Achar	Sr. Suptd, Stores
4.	Mrs. Jayashree	Sr. Programmer, Office Automation Cell
5.	Mrs. Shailaja V. Shetty	Suptd, Accounts Section
6.	Dr. Preetham Shetty KV	Librarian

SECURITY DEPARTMENT

1.	Mr. Hirianna Suvarna S	Security Supervisor

SPORTS DEPARTMENT

1.	Sri. Shyam Sundar M.	P.E.D
2.	Sri. Ganesh Poojary	P.E.D
3.	Ms. Sowjanya M.	P.E.I
4.	Mr. Ravi Prakash C. Anpur	Basket Ball Coach
5.	Mr. Clive Nolan Mascarenhas	Football Coach
6.	Mr. Rajesh Acharya	Cricket Coach

HOSTEL WARDENS

1.	Dr. Veena Devi S.V	Chief Warden, NET Ladies Hostels, Nitte
2.	Dr. Vishwanatha	Chief Warden, NET Gents Hostels, Nitte

HOSTEL SUPERINTENDENT / MANAGER

1.	Mr. John D'Souza	Sr. Manager, Gents Main Hostel
2.	Mr. Manjunatha Suvarna	Hostel Manager, Gents Main Hostel
3.	Mr. Rajesh Ballal	Manager, Gents PG Hostel
4.	Mrs. Gayathri Kamath	Manager, Ladies PG Hostel
5.	Mrs. Chethana Sharma	Manager, Ladies Main Hostel
6.	Mrs. Hema S. Hegde	Superintendent, Hostel Office

REGULATIONS

2023-24

(Applicable for admission batch 2021-22 onwards)

NITTE EDUCATION TRUST | NMAM INSTITUTE OF TECHNOLOGY

CONTENTS

REGULATIONS

REGULATIONS COMMON TO ALL B.E. (CREDIT SYSTEM) DEGREE PROGRAMMES OF NMAM INSTITUTE OF TECHNOLOGY, NITTE

Karkala, Udupi Dist., Karnataka

1. INTRODUCTION

1.1 The general regulations are common to all B.E. (Credit System) Degree Programmes conducted at the NMAMIT, Nitte Campus and shall be called "NMAMIT Regulations".

1.2 The provisions contained in this set of regulations govern the policies and procedures on the Registration of students, imparting Instructions of course, conduct of the examination and evaluation and certification of student's performance and all amendments related to the said Degree programme(s).

1.3 This set of Regulations, on approval by the Academic Council and Governing Council, shall supersede all the corresponding earlier sets of regulations of the BE Degree program (of VTU) along with all the amendments thereto, and shall be binding on all students undergoing the Graduate Degree Programme(s) (Credit System) conducted at the NMAMIT, Nitte with effect from its date of approval. **This set of Regulations, may evolve and get modified or changed through appropriate approvals from the Academic Council / Governing Council from time to time, and shall be binding on all stake holders (The Students, Faculty, Staff of Departments of NMAMIT, Nitte). The decision of the Academic Council/ Governing Council shall be final and binding.**

1.4 In order to guarantee fairness and justice to the parties concerned in view of the periodic evolutionary refinements, any specific issues or matters of concern shall be addressed separately, by the appropriate authorities, as and when found necessary.

1.5 The Academic Council may consider any issues or matters of Concern relating to any or all the academic activities of NMAMIT courses for appropriate action, irrespective of whether a reference is made here in this set of Regulations or otherwise.

1.6 The course shall be called **Bachelor of Engineering** course abbreviated as B.E. (Subject of specialization) – Credit System.

1.7 **DURATION OF THE COURSE**

(a) The course shall extend over a period of total duration of 4 years.

(b) Each year shall have the following schedule with **5** ½ days a week.

Suggested Break down of Academic Year into Semesters

1. No. of Semesters / Year	Three; Two being Main semesters (odd, even) and one being a supplementary semester; after 2 main semesters. (Note: Supplementary semester is primarily to assist weak and / or failed students through make up courses. However, Autonomous Colleges may use this semester to arrange Add-On courses for other students and / or for deputing them for practical training elsewhere.)
2. Semester Duration	Main semester (odd, even) each 19 Weeks; Supplementary Semester 8 Weeks
3. Academic Activities	Main Semester
(Weeks):	Registration of Courses & Course Work (16.0) Examination Preparation and Examination (3.0) Total (19) Supplementary Semester Registration of Courses & Course Work (5.0) Examination Preparation and Examination (3.0) Total (8) Declaration of results: 2 weeks from the date of last examination Inter- Semester Recess: After each Main Semester (2) Total Vacation: 10 weeks (for those who do not register for supplementary semester) and 4 weeks (for those who register for supplementary semester)

(Note: In each semester, there will be provision for students for Registration of courses at the beginning, dropping of courses in the middle and withdrawal from courses towards the end, under the advice of faculty member. These facilities are expected to enhance the learning capabilities of students, minimizing their chances of failure in courses registered and also ensure their better monitoring by Faculty Advisors).

A candidate shall be allowed a maximum duration of eight years from the first semester of admission to become eligible for the award of Bachelor Degree.

The calendar of events in respect of the course shall be fixed by the Senate from time to time, but preferably in line with the academic calendar of the VTU.

2. DEGREE PROGRAMMES

2.1 Undergraduate B.E. Degree Programmes are offered in the following disciplines by the respective programme hosting departments listed below:

i)	Biotechnology Engineering	(BT)
ii)	Civil Engineering	(CV)
iii)	Computer Science & Engineering	(CS)
iv)	Electronics & Communications Engineering	(EC)
v)	Electrical & Electronics Engineering	(EE)
vi)	Information Science & Engineering	(IS)
vii)	Mechanical Engineering	(ME)
viii)	Artificial Intelligence and Machine Learning Engg.	(AM)
ix)	Computer and communication Engineering	(CC)
x)	Robotics and Artificial Intelligence Engineering	(RA)

Other teaching departments are –

i)	Mathematics	(MA)
ii)	Physics	(PH)
iii)	Chemistry	(CY)
iv)	Humanities, Social Sciences and Management	(HU)

2.2 The provisions of these Regulations shall be applicable to any new discipline* that may be introduced from time to time and appended to the above list.

3. REGISTRATION

3.1 Every student after consulting his Faculty Advisor in parent department shall register approved courses (core and elective) to earn credits for meeting the requirements of degree program at the commencement of each Semester on the days fixed for such registration and notified in the academic calendar. Students who fail to register on or before the specified date will have to pay a late fee. Such courses together with their grade and credits earned will be included in the grade card issued by the college at the end of each semester, like odd, even, supplementary and it forms the basis for determining the student's performance in that semester.

3.2 Lower and Upper Limits for Course Credits Registered in a Semester
Course Credit Assignment

All courses comprise of specific Lecture/Tutorial/Practical (L-T-P) schedule. The course credits are fixed based on the following norms.

Lecture / Tutorials / Practical:

i) One hour Lecture per week is assigned one Credit.

ii) 2-hour Tutorial session per week is assigned 1.0 Credit.

iii) 2-hour Lab. session per week is assigned 1.0 credit.

For example, a theory course with L-T-P schedule of 3-2-0 hours will be assigned 4.0 credits.

A laboratory practical course with L-T-P schedule of 0-0-2 hours will be assigned 1.0 credit.

Calculation of Contact Hours / Week – A Typical Example

A student must register, as advised by Faculty Advisor, between a minimum of 15 credits and up to a Maximum of 25 credits.

3.3 Mandatory Pre-Registration for higher semester

In order to facilitate proper planning of the academic activities of the Semester, it is necessary for the students to declare their intention to register for courses of higher semesters (3rd and above) at least two weeks before the end of the current semester choosing the courses offered by each department in the next higher semester which is displayed on the Department Notice Board at least 4 weeks prior to the last working day of the semester.

Registration to a higher semester is allowed only if the student fulfills the following conditions -

i) satisfied all the academic requirements to continue with the programme of studies without termination
ii) cleared all Institute, hostel and library dues and fines, if any, of the previous semester
iii) paid all required advance payments of the Institute and the hostel for the current semester
iv) has not been debarred from registering on any specific grounds by the Institute.

4. ADD / DROP / AUDIT options

4.1 Registration of courses

Each student shall have to register for course work at the beginning of a semester within 2 to 3 days of commencement after discussing with subject teacher and under faculty advice. The permissible

course load to be either average credits (=20) or to be within the limits of minimum (=15) and maximum (=25) credits.

4.2 **DROP-option**

During a specified period at the middle of a semester student's performance in CIE is reviewed by the faculty advisor. Following poor performance by a student he/she can be facilitated to drop identified course(s) (up to the minimum credits specified for the semester). Such course(s) will not be mentioned in the Grade card. Such courses to be re-registered by these students and taken up for study at a later time.

4.3 **Withdrawal from courses**

During a specific period specified towards the end of the semester, student's performance in CIE is reviewed by the Faculty advisors. Following poor performance by a student in identified course (s) he/she is advised to withdraw from such course(s) (up to the minimum credits specified for the semester) with mention in the Grade card (Grade 'W'). Such courses to be re-registered by these students and taken up for study at a later time.

4.4 **AUDIT-option**

A student can register for courses for audit only, with a view to supplement his/her knowledge and/or skills. The student's grades in such course(s) will have to be reflected in the grade card. However, CORE courses shall not be made available for audit. But these shall not be taken into account in determining the student's academic performance in the semester. 'U" grade is awarded to such courses on satisfying the attendance requirements and CIE requirements. The candidate need not appear for SEE in such courses.

5. **COURSE STRUCTURE:**

5.1 **Typical Breakdown for the B.E. Degree Curriculum:**

No.	Course Category	Credit Range
1.	Basic Science Courses	20-25
2.	Engineering Science Courses	18-22
3.	Humanity, Social Science and Management	8-12
4.	Ability Enhancement Courses	10-14
5.	Professional Core Courses (PCC)	40-45
6.	Professional Elective Courses (PEC)	8-12

7.	Open Elective Courses (OE)	8-12
8.	Skill Courses (Project Work / Internship / Seminar)	28-36
9.	Mandatory courses	2
Note: **Student can register between 15 to 25 credits per semester** **Total Credits to be earned : 160**		

5.2 The Department Undergraduate Committee (DUGC) will discuss and recommend the exact credits offered for the programme for the above components, the semester wise distribution among them, as well as the syllabi of all undergraduate courses offered by the department from time to time before sending the same to the Board of Studies(BOS). The BOS will consider the proposals from the departments and make recommendations to the senate for consideration and approval.

5.3 **The earned Credit Requirement for the B.E. Degree is 160.**

Degree is awarded by prescribing the total number of credits to be earned, rather than by using the program duration, giving flexibility to student to plan their career.

5.4 **Mandatory Learning Courses**

These are courses that must be completed by the student at appropriate time or at his convenience. The 'PP' grade is awarded for a Pass in the course and 'NP' grade is awarded for a Fail in the course. In case 'NP' grade is awarded, the student has to re- register for the same course wherein he has no alternative options. However, he/she can opt for other courses if he/she has been provided with multiple options.

The 'PP' and 'NP' grades do not carry grade points and hence not included in the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) computations. However such non-credit mandatory courses are required to be included in the students' performance record (transcript) with Pass or Fail (PP or NP).

Courses that come under this category are the following.

Moral and Ethical Values, Communication skills, Entrepreneurship Development Programme, Environmental issues, Proficiency in a Language etc.

Such courses will not carry any credits for the award of degree, but a pass in each of such course during the programme shall be a necessary requirement for the student to qualify for degree award.

5.5 **PROJECT**

i) Project work at 7th semester shall be completed batch wise. The batch shall consist of a maximum of 4 students.

ii) Project viva-voce examination shall be conducted individually.

5.6 **ELECTIVES**

i) A candidate shall take electives in each semester from groups of electives, commencing from 6th semester.

ii) The minimum number of students to be registered for any Elective offered shall not be less than ten.

iii) A candidate shall opt for his/her choice of electives and register for the same if pre-registration is not done, at the beginning of each of 6th & 7th semesters. The candidate is permitted to opt for change of elective within 15 days from the date of commencement of the semester as per the academic calendar of the college.

6. **ATTENDANCE REQUIREMENT:**

6.1 Each semester is considered as a unit and the candidate has to put in a minimum attendance of 85% in each subject with a provision of condoning 10% of the attendance by Principal for reasons such as medical grounds, participation in University level sports, cultural activities, seminars, workshops and paper presentation.

6.2 The basis for the calculation of the attendance shall be the period of term prescribed by the College by its calendar of events. For the first semester students, the same is reckoned from the date of admission to the course (as per CET/COMED-K or Management allotment).

6.3 The students shall be informed about their attendance position in the first week of every month by the College so that the students shall be cautioned to make up the shortage.

6.4 A candidate having shortage of attendance (<75%) in any course(s) registered shall not be allowed to appear for SEE of such course(s).Such students will be awarded 'N' grade in these courses. He/she shall have to repeat those course(s). Such students shall re-register for the same course(s) core or elective, as the case may be when the particular course is offered next either in a main (odd/even) or supplementary semester.

6.5 **Attendance in CIE and SEE:** Attendance at all examinations both CIE and SEE of each course registered shall be compulsory and there shall not be any provision for re-examinations. Any student against whom any disciplinary action is pending shall not be permitted to attend any SEE in that semester.

7. WITHDRAWAL FROM THE PROGRAMME

7.1 Temporary Withdrawal

a) A student who has been admitted to a degree programme of the college may be permitted once during the course to withdraw temporarily, for a period of one semester, on the grounds of prolonged illness or grave calamity in the family etc., provided –

i) The student applies to the College within 6 weeks of the commencement of the college stating fully the reasons for withdrawal together with supporting documents and endorsement from his parent/guardian.

ii) The College is satisfied about the genuineness of the case and that even by taking into account the expected period of withdrawal, the student has the possibility to complete the programme requirements (160 credits) within the time limits specified by the university.

iii) The student does not have any dues or demands at the College / University including tuition and other fees as well as library material.

iv) A student availing of temporary withdrawal shall be required to pay such fees and/or charges as may be fixed by the college until such time as his/her name appears on the Student's roll list. The fees/charges once paid shall not be refunded.

v) A student will be entitled to avail the temporary withdrawal facility only once during his/her studentship. However, any other concession for the concerned student shall have to be approved by the academic council.

7.2 Permanent Withdrawal

Any student who withdraws admission before the closing date of admission for the Academic Session is eligible for the refund of the deposits only. Fees once paid will not be refunded on any account.

Once the admission for the year is closed, the following conditions govern withdrawal of admissions.

(a) A student who wants to leave the College for good, will be permitted to do so (and take Transfer Certificate from the College, if needed), only after remitting the Tuition fees as applicable for all the remaining semesters and clearing all other dues if any.

(b) Those students who have received any scholarship, stipend or other forms of assistance from the College shall repay all such amounts.

(c) The decision of the Principal of the College regarding withdrawal of a student is final and binding.

8. EVALUATION SYSTEM

8.1 The Academic Performance Evaluation of a student shall be according to a Letter Grading System, based on the Class Performance Distribution.

8.2 The Letter grades S, A, B, C, D, E, F indicate the level of academic achievement, assessed on a decimal (0-10) scale.

8.3 The Letter grade awarded to a student in a course, for which he has registered shall be based on his performance in quizzes, tutorials, assignments etc., as applicable, in addition to two mid-semester examinations and one semester end examination. The distribution of weightage among these components may be as follows.

Semester End Examination (SEE) : 50% (50 marks)

Continuous Internal Evaluation (CIE) : 50% (50 marks)

i) Quizzes, Tutorials, Assignments, Seminars, mini projects, tutorials etc. : 10 marks

ii) Mid-semester Examination : 40 marks

Any variation, other than the above distribution, requires the approval of the pertinent DUGC and Academic Council.

8.4 The letter grade awarded to a student in a 0-0-P (Practical) course, is based on an appropriate continuous evaluation scheme that the course instructor shall evolve, with the approval of the pertinent DUGC and the performance in SEE held on specified period in a semester.

8.5 The course Instructor shall announce in the class and/or display at the Faculty door/website the details of the Evaluation Scheme, including the distribution of the weightage for each of the components and method of conversion from the raw scores to the letter-grades within the first week of the semester in which the course is offered, so that there are no ambiguities in communicating the same to all the students concerned.

8.6 Passing standards

Evaluation Method	Passing Standard
Sessional (CIE)	Score: ≥40% (≥20 marks)
Terminal (SEE)	Score: ≥40% (≥20 marks)

i) Project work evaluation: The evaluation of CIE of the project work shall be based on the progress of the student in the work assigned by the project supervisor, periodically evaluated by him/her together with a Department committee constituted for this purpose. Seminar presentation, project report and final oral examination conducted by project evaluation committee at the department level shall form the SEE of the project work.

ii) In the case of other requirements, such as, seminar, industrial internship, field work, comprehensive viva voce, if any, the assessment shall be made as laid down by the Academic council.

iii) **There shall be no re-examination for any course in the credit system.**

However, students

- who have abstained from attending CIE or SEE without valid reasons ('N' grade), or
- who have failed ('F' grade) to meet the minimum passing standards prescribed for CIE and/or SEE, or
- who have been detained for want of attendance, or
- who have withdrawn ('W' grade),
- who have dropped any course

shall be required to re-register for such course(s) and go through CIE and SEE again and obtain a grade equal to or better than E in each case. While such students should re-register for same course(s) if core, they can re-register for alternative course(s) from among the elective courses, as the case may be. The re- registration shall be possible when the particular course is offered again either in a main (Odd/Even) or a supplementary semester.

8.7

i) Grade point scale for absolute grading

Level	Out Standing	Excellent	Very Good	Good	Average	Poor	Fail
Grade	S	A	B	C	D	E	F
Grade Points	10	09	08	07	06	04	00
Score (Marks) Range(%)	≥ 90	< 90 - ≥80	< 80- ≥70	< 70- ≥60	< 60 - ≥50	< 50 - ≥40	< 40

ii) The grade points given above help in the evaluation of credit points earned by the student in a course as the credit points are equal to the number of credits assigned to the course multiplied by the grade points awarded to the student in that course. This shall be used in arriving at the credit index of the student for that semester, as it is the sum total of all the credit points earned by the student for all the courses registered in that semester.

8.8 **Earning of Credits**

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range S-E. Letter grade 'F' in any course implies failure of the student in that course and no credits earned.

8.9 The Transitional Grades 'I', 'W' and 'X' would be awarded by the teachers in the following cases. These would be converted into one or the other of the letter grades (S-F) after the student completes the course requirements.

- Grade 'I': To a student having satisfactory attendance at classes and meeting the passing standard at CIE, but remained absent from SEE for valid & convincing reasons acceptable to the College, like:

i) Illness or accident, which disabled him/her from attending SEE;
ii) A calamity in the family at the time of SEE, which required the student to be away from the College;

- Students who remain absent for Semester End Examinations due to valid reasons and those who are absent due to health reasons are required to submit the necessary documents along with their request to the Controller of Examinations to write Make up Examinations within 2 working days of that particular examination for which he or she is absent, failing which they will not be given permission. This is admissible only for students who have more than 45 CIE marks.
- Grade 'W': To a student having satisfactory attendance at classes, but withdrawing from that course before the prescribed date in a semester under Faculty Advice
- Grade 'X': To a student having attendance ≥85% and CIE rating (90%), in a course but SEE performance observed to be poor, which could result in a F grade in the course. **(No 'F' grade awarded in this case but student's performance record maintained separately).**

8.10 **Grade Card**

Each student shall be issued a Grade Card at the end of each semester. This will have a list of all the courses registered by a student in the semester, together with their credits, the letter grades with grade points awarded. Only those courses registered for credit and having grade points shall be included in the computation of the students performance like SGPA and CGPA and the courses taken for audit will not form part of this computation. The results of mandatory courses, which are of the non-credit type shall also be reflected in the Grade card as PP (for Passed) or NP (for not passed). **Each UG student shall have to obtain the grade PP in each mandatory course to qualify for the Degree awarded by the university.**

8.11 **The Make Up Examination**

The Make Up Examination facility would be available to students who may have missed to attend the SEE of one or more course(s) in a semester for valid reasons and given the 'I' grade; Also, students having the 'X' grade shall be eligible to take advantage of this facility. The makeup examination would be held as per dates notified in the Academic Calendar. However, it would be possible to hold a makeup examination at any other time in the semester with the permission of the Academic Council of the College. In all these cases, the standard of makeup examinations shall be same as the regular SEE for the course(s).

a) All the 'I' and 'X' grades awarded to the students would be converted to appropriate letter grades after the make-up examinations. Any outstanding 'I' and 'X' grades after the last

scheduled make-up examinations shall be automatically converted to 'F' grade.

b) All the 'W' grades awarded to the students would be eligible for conversion to the appropriate letter grades only after the concerned students re-register for these courses in a main/ supplementary semester and fulfill the passing standards for their CIE and (CIE+SEE).

9. EVALUATION OF PERFORMANCE

The overall performance of a student will be indicated by two indices:

SGPA; which is the Semester Grade Point Average, and CGPA which is the Cumulative Grade Point Average.

SGPA for a semester is computed as follows.

$$\text{SGPA} = \frac{\sum [\,(\text{course credit}) \times (\text{Grade point})]\ (\text{for all courses in that semester})}{\sum [\,(\text{course credits})]}$$

CGPA is computed as follows:

$$\text{CGPA} = \frac{\sum [\,(\text{course credits}) \times (\text{Grade points})]\ (\text{for all courses excluding those with F grades until that semester})}{\sum (\text{course credits})]\ (\text{for all courses excluding those with F grades until that semester})}$$

10. COMMUNICATION OF GRADES

The SGPA and CGPA respectively, facilitate the declaration of academic performance of a student at the end of a semester and at the end of successive semesters. Both of them would be normally calculated to the second decimal position.

11. VERTICAL PROGRESSION (PROMOTION / ELIGIBILITY TO HIGHER SEMESTERS)

11.1 There shall be no restriction for promotion from an odd semester to the next even semester, provided the student has fulfilled the attendance requirement.

11.2 **A Student shall be declared fail if he / she**

(i) Has not satisfied the CIE requirements of any Course/s.

(ii) Has not registered for the SEE even after satisfying the attendance and CIE requirements.

11.3 **(A) Vertical Progression in case of students admitted to First year:**

(a) Students having not more than four F grades in the two semesters of first year of the Programme shall be eligible to move to second year.

(a.1) Students having not more than four F grades in the four semesters of I and II year shall be eligible to move to III year.

(a.2) Students who have earned all the prescribed credits of I year, and having not more than four grades in the four semesters of II and III year shall be eligible to move to IV year.

(B) Vertical Progression in case of Diploma students admitted to Second year (lateral entry):

(a) Students having not more than four F grades (excluding the Fail or pass status of Additional Mathematics I and II) in the two semesters of II year of the Programme shall be eligible to move to III Year.

(a.1) Students having not more than four F grades (excluding the Fail or pass status of Additional Mathematics I and II, if any) in the four semesters of II and III year shall be eligible to move to IV year.

(b) The mandatory non-credit Courses Additional Mathematics I and II prescribed at III and IV semesters respectively, to lateral entry Diploma holders admitted to III semester of B.E/B.Tech. Programmes shall attend the classes during the respective semesters to satisfy attendance and CIE requirements and to appear for the University examinations.

(b.1) In case, any student fails to satisfy the attendance requirement of the Courses Additional Mathematics I and II, he/she shall not be eligible to appear for the Semester End Examinations of that semester and shall not be permitted to take admission to next higher semester. The candidate shall be required to repeat that semester during the subsequent year.

(b.2) Students who have satisfied the attendance requirement but not the CIE requirements of the Courses Additional Mathematics I and II shall be permitted to register afresh and appear for SEE after satisfying the CIE requirements in the same Course/s (with or without satisfying the attendance requirement) when offered during subsequent semester/s.

(c) Completion of Additional Mathematics I and II shall be mandatory for the award of degree.

(C) Vertical Progression in case of B.Sc students admitted to Second year (Lateral entry):

(a) Students having not more than four F grades (excluding the Fail or pass status of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme) in the two semesters of II year of the Programme shall be eligible to move to III year.

(a.1) Students having not more than four F grades (excluding the Fail or pass status of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme, if any) in the four semesters of II and III year shall be eligible to move to IV year.

(b) The prescribed mandatory non-credit Courses Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme to lateral entry B. Sc holders admitted to III semester of B.E/B. Tech Programmes, shall attend the classes during the respective semesters to complete CIE and attendance requirements and to appear for the University examinations.

(b.1) In case, any student fails to satisfy the attendance requirement of the above said Courses; he/she shall not be eligible to appear for the Semester End Examinations of that semester and shall not be permitted to take admission to next higher semester. The candidate shall be required to repeat that semester during the subsequent year.

(b.2) Students who have satisfied the attendance requirement but not the CIE requirements of the above said Courses, shall be permitted to register afresh and appear for SEE after satisfying the CIE requirements in the same Course/s (with or without satisfying the attendance requirement) when offered during subsequent semester/s.

(c) Completion of Engineering Graphics and Elements of Civil Engineering and Mechanics shall be mandatory for the award of degree.

The Principal of each college shall make suitable arrangements in the timetable to facilitate the B. Sc students to attend the above mentioned courses to satisfy the CIE and attendance requirements and to appear for the University examinations.

11.4 Termination from the programme

A student shall be required to withdraw (discontinue) from the programme and leave the college on the following grounds.

i) **Failure to secure a CGPA = 5.0 on three consecutive occasions.**
ii) **Failure to earn a credit of 160 (120 for lateral entry students) in 8 years (6 years for lateral entry students) of duration from the year of admission including the duration of temporary withdrawal (leave of absence).**
iii) Absence from classes for more than **six weeks at a time** in a semester without leave of absence being granted by competent authorities.
iv) Failure to meet the standards of discipline as prescribed by the college from time to time.

12. AWARD OF CLASS

Sometimes, it would be necessary to provide equivalence of these averages, viz., SGPA and CGPA with the percentages and/or Class awarded as in the conventional system of declaring the results of University examinations. This can be done by prescribing certain specific thresholds in these averages for Distinction, First Class and Second Class. This can be seen from the following Table.

Percentage Equivalence of Grade Points (For a 10-Point Scale)

Grade Point	Percentage of Marks	Class
≥ 7.75	≥ 70%	Distinction
≥ 6.75	≥ 60%	First Class
< 6.75	< 60%	Second Class

Percentage = (GPA - 0.75) x 10

13. APPEAL FOR REVIEW OF GRADES

a. The entire process of evaluation shall be made transparent and the course instructor shall explain to a student why he/she gets whatever grade he/she is awarded, if and when required. A mechanism for review of grade is incorporated in the evaluation system. However, before appealing for such review, a student shall first approach the concerned course Instructor and then the concerned DUGC, with the request to do the needful; and only in situations where satisfactory remedial measures have not been taken, the student may then appeal to the Department Academic Appeals Boards (DAAB) before the date specified in Academic Calendar, by paying the prescribed fees.

b. The fee for such an appeal will be decided by the Senate from time to time. If the appeal is upheld by DAAB, then the fee amount will be refunded to the student.

14. AWARD OF DEGREE

14.1 (1) B.E. Degree

a) Students shall be declared to have completed the Programme of B.E./B.Tech. degree and is eligible for the award of degree, provided the students have undergone the stipulated Course work of all the semesters under the Scheme of Teaching and Examinations and has earned the prescribed number of credits (160 credits for regular students registered for 4 year degree programmes & 120 for lateral entry students).

b) For the award of degree, a CGPA≥5.00 at the end of Programme shall be mandatory.

c) Completion of Additional Mathematics I and II, shall be mandatory for the award of degree to lateral entry diploma students.

d) Completion of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme shall be mandatory for the award of degree to lateral entry B.Sc. graduates.

e) (i) Over and above the academic credits, every Day College regular student admitted to the 4 years Degree Programme and every student entering 4 years Degree Programme through lateral entry, shall earn 100 and 75 Activity Points respectively through AICTE Activity Point Programme for the award of degree. Students transferred from other Universities/Autonomous colleges under VTU to fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eight semester Grade Card.

(ii) Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity Points before the commencement of 8th semester examinations, eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

(2) B.E. (Honors) Degree

VTU, Belagavi has framed the guidelines for applying for the award of Bachelor of Engineering (Honors) degree.

These Regulations are applicable for the following students:

1. Admitted to **I semester** / I year from the academic year **2018-19** (i.e. USN XXX18XXXXX)
2. Admitted to **III semester** / II year from the academic year **2019-20** (i.e. USN XXX19XX4XX)
3. These Regulations are uniformly applicable to Affiliated, Autonomous and Constituent Colleges under VTU.

Eligibility criterion

(i) Students have to earn 18 or more additional credits through MOOCs.

(ii) Students shall register for this course from fifth semester onwards.

(iii) Students shall obtain a grade $\geq$ D in all the courses in first attempt only in all the semesters till 5th.

(iv) Students shall obtain CGPA of 8.5 and above at the end of fourth semester.

(v) For Diploma students, they shall complete Additional Mathematics I and II during 3rd and 4th semesters in first attempt only.

Requirements:

(i) Students shall maintain a grade $\geq$D in all courses from 5thto 8thsemester in 'first attempt' only.

(ii) Students not having CGPA greater than or equal to 8.5 at the end of the B.E. programme shall not be eligible for the award of Honors degree, even if they have satisfied the requirement of additional credits.

(iii) Students shall take up additional course work, other than the regular courses prescribed by the University from 5thto 8thsemester from NPTEL and other platforms notified by the University and complete the same in any number of attempts with a final score (online assignments: 25 % + Proctored examination: 75 %) leading to the following certificates – ELITE (60 to 75 %) or ELITE + SILVER (76 to 89 %) or ELITE + GOLD (≥ 90 %) before closure of eighth semester as per the academic calendar.

(iv) Students shall be permitted to drop the registered course work (s) and select alternative course work (s) in case they cannot give proctored examination.

(v) Students have to take courses from the list of MOOCs approved by the University, which can be from NPTEL / SWAYAM / other platforms.

(vi) Students shall select courses in consultation with their Class Advisor, such that the content / syllabus of them are not similar to that of the core courses, professional electives or open electives, which the students may chose in the program.

(vii) Students shall earn the additional credits for these courses through MOOCs, by only appearing in person to the proctored examinations conducted by NPTEL / SWAYAM / other platform. The method of assessment shall be as per NPTEL online platform.

(viii) The Credit equivalence shall be as follows - 4 weeks of online course duration – 1 credit, 8 weeks of online course duration – 2 credits and 12 weeks of online course duration – 3 credits.

Registration:

(i) Any student meeting the eligibility criteria and interested to register for Honors degree qualification shall apply to the University through the Principal in the prescribed form along with the prescribed application fees within 15 working days after notification by the University.

(ii) The Registrar shall notify the registration of the student and it will be notified to the student and the student shall pay a one-time, non-refundable registration fees as prescribed by the University to confirm the registration.

Award of Honors Qualification:

(i) Students who successfully complete the MOOCs prescribed by the University and submit their E-certificates to the University through the Principal against the notification issued by the Registrar in time before the closure of eighth semester, as per the academic calendar shall be eligible for B.E. (Honors) degree. If a student does not submit the certificates in time on or before the last date, their request shall not be considered, even if they have earned the requisite number of credits.

(ii) The Honors degree shall be awarded only if the CGPA at the end of the B.E. programme is equal to or greater than 8.5.

(iii) A student who has earned the requisite number of credits and who has submitted the certificates in time and has been accepted by the University will get B.E. degree with Honors suffixed indicating recognition of higher achievement by the student concerned.

(iv) Further students fulfilling all the above requirements shall be entitled to receive their transcripts indicating both the achievement of the student concerned.

(v) The award of the Honors degree shall be recommended by the Academic Senate and approved by the Executive Council of the University.

14.2 (1) Noncompliance of CGPA ≥ 5.00 at the end of the Programme

(a) Students, who have completed all the courses of the Programme but not having a CGPA ≥ 5.00 at the end of the Programme, shall not be eligible for the award of the degree.

(b) In the cases of 14.2 (1) a, students shall be permitted to appear again for SEE in course/s (other than Internship, Technical seminar, Project (Mini and Main), and Laboratories) of any Semester/s without the rejection of CIE marks for any number of times, subject to the provision of maximum duration of the Programme to make up the CGPA equal to or greater than 5.00 for the award of the Degree.

(c) In case, the students earn improved grade/s in all the reappeared course/s, the CGPA shall be calculated considering the improved grade/s. If it is ≥5.00, the students shall become eligible for the award of the degree. If CGPA <5.00, the students shall follow the procedure laid in 14.2 (1) b

(d) In case, the students earn improved grade/s in some course/s and the same or lesser than the previously earned pass grade/s in the other reappeared course/s, the CGPA shall be calculated considering the improved grade/s and the pass grades earned before the reappearance. If it is ≥5.00, the students shall become eligible for the award of the degree. If CGPA<5.00, the students shall follow the procedure laid in 14.2 (1) b

(e) In case, the students earn improved grade/s in some courses and fail in the other reappeared course/s, the CGPA shall be calculated by considering the improved grade/s and the previously earned pass grade/s of the reappeared course/s in which the students have failed. If it is≥5.00, the students shall become eligible for the award of the degree. If CGPA <5.00, the students shall follow the procedure laid in 14.2 (1) b

(f) In case, the students fail (i.e., earns F grade) in all the reappeared course/s, pass grade/s of the course/s earned by the students before reappearance shall be retained. In such cases, the students shall follow the procedure laid in 14.2 (1) b

(g) Students shall obtain written permission from the Registrar (Evaluation) to reappear in SEE to make up the CGPA equal to or greater than 5.00.

(2) Noncompliance of Mini-project

(a) The mini-project shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the mini-project shall be declared fail in that course and shall have to complete the same during subsequent University examinations after satisfying the Mini-project requirements. Also, mini-project shall be considered for eligibility to VII semester.

(3) Noncompliance of Internship

(a) All the students of B.E/B.Tech shall have to undergo mandatory internship of 4 weeks during the vacation. A University examination shall be conducted during VIII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail in that Course and shall have to complete the same during subsequent University examinations after satisfy the internship requirements.

14.3 The maximum duration for a student for complying to the Degree requirements is 16 – semesters from the date of first registration for his first semester (8 years from the date of admission to first year, (12 semesters / 6 years from the date of admission for lateral entry student)).

E GRADUATION REQUIREMENTS AND CONVOCATION

E.R A student shall be declared to be eligible for the award of the degree if he/she has

1. **Fulfilled "Award of Degree" Requirements**
2. **No Dues to the College, Departments, Hostels, Library, Central Computer Centre and any other centres**
3. **No disciplinary action pending against him/her.**

E.S The award of the degree must be recommended by the Senate

E.T Convocation

Degree will be awarded for the students who have graduated during the preceding academic year. Students are required to apply for the Convocation along with the prescribed fees, after having satisfactorily completed all the degree requirements (refer 'Award of Degree') within the specified date in order to arrange for the award of the degree during convocation.

F AWARD OF PRIZES, MEDALS, CLASS & RANKS

For the award of Prizes and Medals, the conditions stipulated by the Donor may be considered as per the statutes framed by the College for such awards.

Sometimes, it would be necessary to provide equivalence of these averages, viz., SGPA and CGPA with the percentages and/or Class awarded as in the conventional system of declaring the results of University examinations. This can be done by prescribing certain specific thresholds in these averages for Distinction, First Class and Second Class as described in 12.

G CONDUCT AND DISCIPLINE

G.R Students shall conduct themselves within and outside the premises of the College in a manner befitting the students of an Institution of National Importance.

G.S **As per the order of Honorable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.**

G.T The following acts of omission/ or commission shall constitute gross violation of the Code of Conduct and are liable to invoke disciplinary measures:

1. Ragging.
2. Lack of courtesy and decorum; indecent behaviour anywhere within or outside the campus.
3. Willful damage or stealthy removal of any property/belongings of the College/Hostel or of fellow students/citizens.
4. Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.
5. Mutilation or unauthorized possession of Library books.
6. Noisy and unseemly behaviour, disturbing studies of fellow students.
7. Hacking in computer systems (such as entering into other Person's area without prior permission, manipulation and/or Damage of computer hardware and software or any other Cyber crime etc.).
8. Plagiarism of any nature.
9. Any other act of gross indiscipline as decided by the Senate from time to time.
10. Use of Mobile in the college Academic area.
11. Smoking in College Campus and supari chewing.
12. Unauthorized fund raising and promoting sales.

Commensurate with the gravity of offence the punishment may be: reprimand, expulsion from the hostel, debarring from an examination, disallowing the use of certain facilities of the College, rustication for a specified period or even outright expulsion from the College, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.

G.U For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the Chief Warden, the Head of the Department and the Dean (Academics), respectively, shall have the authority to reprimand or impose fine.

G.V All cases involving punishment other than reprimand shall be reported to the Principal.

G.W Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the Controller of Examinations for taking appropriate action.

18. EARNING OF ACTIVITY POINTS FOR THE AWARD OF DEGREE

18.1 As per VTU guidelines, every students entering 4 year degree programme should earn 100 activity points & every students entering 4 year degree programme through Lateral Entry should earn 75 activity points for the award of the Engineering Degree.

18.2 The Activity Points earned will be reflected on the student's eighth semester Grade Card.

18.3 The activities can be spread over the years (duration of the programme) any time during the semester weekends and holidays, as per the interest & convenience of the students from the year of entry to the programme.

18.4 Activity Points (non-credit) have no effect on SGPA/CGPA point.

18.5 In case students fail to earn the prescribed Activity Points, Eighth semester Grade Card shall be issued only after earning the required Activity Points.

Note: Students are required to be inside the examination hall 20 minutes before the commencement of examination. This is applicable for all examinations (Semester end/Supplementary/makeup) henceforth. Students will not be allowed inside the examination hall after the commencement, under any circumstances.

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LIST OF MAJOR SCHOLARSHIPS

Applicable to	*Types of scholarship*	*Method*	*Website*
For SC/ST Students	*Income : Below Rs.2,50,000/-*	*Online application*	SSP
	Income : Above Rs.2,50,000/- to Rs.10,00,000/-		
For Others	*Category I : Income Below Rs.2,50,000/-*	*Online application*	
	Category 2A, 3A, 3B Income Below Rs.1,00,000/-	*Online application*	
	GSB & Brahmins EWS Certificate upto Rs.8,00,000/-	*Online application*	
	Minority students Income Below Rs.2,50,000/-	*Online application*	*NSP & SSP*
Parents must have Beedi Id. Card	*Beedi Scholarship*	*Online application*	scholarships.gov.in or nsp.gov.in

1. Scholarship details will be published in the notice board near College Academic Section. Students must see the notice board and submit the application before due dates.

2. All SC/ST and Category I students who have not paid any fee in CET must apply for Fee concession or Scholarship. Otherwise they must pay the tuition fee and college fee.

3. The students, who are applying for any of the above scholarship through online, must submit the hardcopy with supporting documents (with attestation) to the academic section in time.

B. E. SYLLABUS

INFORMATION SCIENCE & ENGINEERING

V & VI SEMESTER

With

Scheme of Teaching

& Examination

DEPARTMENT: INFORMATION SCIENCE & ENGINEERING

Faculty Members: Information Science and Engineering

1.	Dr. Balasubramani R.	Professor
2.	Dr. Karuna Pandit	Professor
3.	Dr. Karthik Pai B. H.	Professor
4.	Dr. Vasudeva	Professor
5.	Dr. Ashwini B.	Associate Professor and HoD
6.	Dr. Ravi B.	Associate Professor
7.	Dr. Usha Divakarla	Associate Professor
8.	Dr. Manjula Gururaj	Associate Professor
9.	Dr. Sumathi	Associate Professor
10.	Dr. Naganna Chetty	Associate Professor
11.	Dr. Jason Elroy Martis	Associate Professor
12.	Dr. Bola Sunil Kamath	Assistant Professor Gd III
13.	Mr. Devidas	Assistant Professor Gd III
14.	Dr. Manjunatha	Assistant Professor Gd III
15.	Mr. Vasudeva Pai	Assistant Professor Gd III
16.	Ms. Deepa	Assistant Professor Gd III
17.	Ms. Rashmi Naveen	Assistant Professor Gd III
18.	Mr. Abhishek Rao	Assistant Professor Gd III
19.	Mr. Deepak D.	Assistant Professor Gd III
20.	Dr. Vaikunth Pai	Assistant Professor Gd III
21.	Ms. Chinmai Shetty	Assistant Professor Gd III
22.	Mr. Krishnaraj Rao N. S.	Assistant Professor Gd III
23.	Mr. Shrikanth Bhat K.	Assistant Professor Gd II
24.	Ms. Alaka Anath	Assistant Professor Gd II
25.	Mr. Santhosh S.	Assistant Professor Gd II
26.	Ms. Preethi Salian	Assistant Professor Gd II
27.	Ms. Prathyakshini	Assistant Professor Gd II
28.	Ms. Pratheeksha Hegde N.	Assistant Professor Gd II
29.	Ms. Anusha N.	Assistant Professor Gd I
30.	Ms. Tanzila Nargis	Assistant Professor Gd I
31.	Ms. Ashwitha C. Thomas	Assistant Professor Gd I
32.	Ms. Vanishree B. S.	Assistant Professor Gd I

VISION:

Excellence in information science and engineering through a strong research and teaching environment that address the emerging global challenges and market demands.

MISSION:

- To provide outstanding education and research training to the students for their productive careers in industry, academia and government.
- To provide a learning environment that promotes excellence and innovation, ethical practice and responsibility towards society.
- To prepare the students to practice their professions competently to meet the ever-changing needs of society and to continue learning their discipline, allowing them to move into other related fields.
- To promote active learning, critical thinking, and engineering judgment coupled with business and entrepreneurial skills.

Programme Educational Objectives (PEOs):

- Graduates must gain both theoretical and practical knowledge to identify, formulate & solve challenges in Information Science & Engineering problems.
- Graduates must work productively as Information Science Engineers, including supportive and leadership roles on multidisciplinary teams.
- Graduates must communicate effectively, recognize and incorporate societal needs and constraints in their professional endeavors, and practice their profession with high regard to legal and ethical responsibilities.
- Graduates must engage in life-long learning, such as graduate study, to remain current in their profession and be leaders in our technological society.

Programme Outcomes (POs):

After successful completion of the program students will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals and Information Science & Engineering principles to the solution of complex engineering problems.
2. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3. 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.
4. Design solutions to the problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline.
5. Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequence responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcome (PSO):

1. Design, develop and test software systems to provide solutions to real world problems.
2. Equip students with skills to analyze, design and recommend the appropriate IT infrastructure required for the implementation of a project.

Graduate Attributes:

Sl. No.	Graduate Attributes
a	Engineering Knowledge
b	Problem Analysis
c	Design / development of solutions
d	Conduct investigations of complex problems
e	Modern tool usage
f	The engineer and society
g	Environment and sustainability
h	Ethics
i	Individual and team work
j	Communication
k	Project management and finance
l	Life-long learning

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

SCHEME OF TEACHING AND EXAMINATION

V SEMESTER B.E. 21 Hours / Week

SN	Course Category	Course Code	Course Title	Teaching Department	Teaching Hours / Week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC	21IS501	Theory of Computation	IS	3	-	-	-	3	50	50	100	3
2	IPCC	21IS502	Computer Network and Communication	IS	3	-	2	-	3	50	50	100	4
3	PCC	21IS503	Database Management Systems	IS	3	-	-	-	3	50	50	100	3
4	PCC	21IS504	Operating Systems	IS	3	-	-	-	3	50	50	100	3
5	PCC	21IS505	Application Development Lab	IS	-	-	2	-	3	50	50	100	1
6	AEC	21HU511	Research Methodology and IPR	IS	2	-	-	-	3	50	50	100	2
7	HSMC	21CV512	Environmental Studies	CV	1	-	-	-	1	50	50	100	1
8	AEC	21ISA5X	Ability Enhancement Course - V	IS	-	-	2	-	3	50	50	100	1
TOTAL					**15**	**-**	**6**	**-**	**-**	**400**	**400**	**800**	**18**

Ability Enhancement Course – V: 21ISA51 Internet of Things

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

SCHEME OF TEACHING AND EXAMINATION

VI SEMESTER B.E. 21 Hours / Week

SN	Course Category	Course Code	Course Title	Teaching Department	Teaching Hours / Week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	21IS601	Machine Learning	IS	3	-	2	-	3	50	50	100	4
2	HSMC	21IS602	Industrial Engineering and Management	IS	3	-	-	-	3	50	50	100	3
3	PCC	21IS603	Cryptography & Network Security	IS	3	-	-	-	3	50	50	100	3
4	PEC	21ISE1XX	Professional Elective Course - 1 (Group 1)	IS	3	-	-	-	3	50	50	100	3
5	OEC	21ZZ8XYY	Open Elective Course – 1	IS	3	-	-	-	3	50	50	100	3
6	PCC	21IS604	Network Security Lab.	IS	-	-	2	-	3	50	50	100	1
7	PROJ	21IS605	Mini Project	IS	-	-	2	-	-	100	-	100	2
8	INT	21INT61	Innovation/Entrepreneurship/Social based Internship (4 Weeks)	IS	-	-	-	-	-	100	-	100	3
TOTAL					**15**	**-**	**6**	**-**	**-**	**500**	**300**	**800**	**22**

ELECTIVE LIST

Elective Groups for 6th Semester B.E.

Professional Elective Course - 1 (Group 1)	
Course Code	**Course Title**
21ISE111	Information Storage Management
21ISE112	Total Quality Management for Sustainable Growth
21ISE113	IOS App Development using Xcode and Swift
21ISE114	Management and Entrepreneurship for IT Industry
21ISE121	C# and NET Technologies
21ISE122	Full Stack Development
21ISE123	Object Oriented Modeling and Design
21ISE124	Software Testing
21ISE131	Computing in Communication Networks
21ISE132	Network Engineering
21ISE133	Adhoc Networks
21ISE134	Software Defined Networks
21ISE141	Fundamentals of Image Processing
21ISE142	Natural Language Processing
21ISE143	Front-end JavaScript Angular Framework
21ISE144	Computer Vision
21ISE151	Parallel Computer Architecture & Programming
21ISE152	Computer Graphics
21ISE153	Operations Research
21ISE154	Robotic Process Automation Design & Development

Open Elective Course – 1 *(Offered by ISE Department to students of other programs)*	
Course Code	**Course Title**
21IS8X38	Introduction to Python Programming
21IS8X76	Web technologies
21IS8X83	Software Engineering Practices
21IS8X84	Introduction to Cyber Security

THEORY OF COMPUTATION

Course Code	:	21IS501		CIE Marks	:	50
Teaching Hours /Week (L:T:P)	:	3-0-0		SEE Marks	:	50
Total Hours	:	39		Credits	:	03

Course Learning Objectives:

This Course will enable students to

1. Outline the theory behind the basic design of machines, the relation between formal languages and programming languages, and their applications.
2. Make use of regular expressions, find the equivalence between finite automata and regular languages, and identify non-regular languages.
3. Design context-free grammars along with simplification of grammars.
4. Get the idea of designing pushdown automata, and identify non-context-free languages.
5. Tell how Turing machines solve any computational process carried by present day computers, their design.

UNIT – I

AUTOMATA:

Why study automata theory, Central concepts of automata theory.

FINITE AUTOMATA:

Deterministic Finite automata, Nondeterministic finite automata, An application: Text search, Finite automata with epsilon-transitions.

REGULAR EXPRESSIONS AND LANGUAGES:

Regular expressions, Finite automata and Regular expressions, Applications of regular expressions.

PROPERTIES OF REGULAR LANGUAGES:

Proving languages not to be regular.

(Text Book-1: Chapter 1: 1.1, 1.5; Chapter 2: 2.1 to 2.5; Chapter 3: 3.1, 3.2.2, 3.2.3, 3.3; Chapter 4: 4.1)

15 Hours

UNIT – II

PROPERTIES OF REGULAR LANGUAGES:

Closure properties of regular languages, Equivalence and minimization of automata. ***(Text Book-1: Chapter 4: 4.2, 4.4)***

CONTEXT-FREE GRAMMARS AND LANGUAGES:

Context free grammars, Parse Trees: Constructing parse tree, The yield of a parse tree.

Ambiguity in Grammars and Languages : Ambiguous Grammar, Removing ambiguity form grammars. ***(Text Book 1: Chapter 5 : 5.1, 5.2: 5.2.1, 5.2.2, 5.4: 5.4.1 , 5.4.2)***

PUSHDOWN AUTOMATA

Definition of the Pushdown Automata, Languages of a PDA. ***Chapter 6: 6.1, 6.2.1, 6.2.2;***

15 Hours

UNIT – III

PROPERTIES OF CONTEXT-FREE LANGUAGES:

Normal forms for CFGs. *(Text Book-1: Chapter 7: 7.1)*

INTRODUCTION TO TURING MACHINES

The Turing Machine, Extensions to the basic Turing Machines

Chapter 8: 8.2, 8.4

RECURSIVELY ENUMERABLE LANGUAGES

Recursively enumerable languages and Recursive, The Chomsky hierarchy.

(Text Book-2: Chapter 10: 10.1, 10.4)

9 Hours

Course Outcomes:

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

1. Outline the fundamental understanding of the core concepts in automata theory and formal languages and its applications. Discover finite automata for different language classes. Apply the procedure to convert deterministic finite automata to non-deterministic finite automata.
2. Find the regular expression for a given language and illustrate equivalence between finite automata and regular languages. Show the properties of regular languages and minimize the given finite automata.
3. Discover context-free grammars for different language classes. Demonstrate the ambiguity and unambiguous grammars.
4. Discover Pushdown automata for different language classes.
5. Translate the context-free grammars from one form to another. Discover Turing machines for different language classes. Explain the class of languages and their relationship.

Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	3						1				3		
CO2	2	3											2		
CO3	2	2	3						1				3		
CO4	2	2	3						1				3		
CO5	2	2	3						1				3		

3: Substantial (High) 2: Moderate (Medium) 1: Poor (Low)

TEXTBOOKS:

1) J.P. Hopcroft, Rajeev Motwani, and J.D. Ullman, "Introduction to Automata Theory, Languages and Computation", Third Edition, Pearson Education 2012.
2) John C Martin, "Introduction to languages and The Theory of Computation", Third Edition, Tata McGraw Hill, 2008.

REFERENCE BOOKS:

1. Peter Linz, "An Introduction to formal languages and Automata", Fourth Edition, Narosa Publishing House, 2011.
2. Michael Sipser, "Introduction to the Theory of Computation", Third Edition, MIT Press, 2014.

E-Books / Online Resources:

1. https://www.eecs.wsu.edu/~ananth/CptS317/Lectures/index.htm
2. https://www.cs.virginia.edu/~robins/Sipser_2006_Second_Edition_Problems.pdf
3. http://infocat.ucpel.tche.br/disc/lfa/docs/IAT.pdf

MOOCs:

1. http://nptel.ac.in/courses/106106049/
2. http://aduni.org/courses/theory/index.php?view=cw
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-045j-automata-computability-and-complexity-spring-2011/lecture-note*s/

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into 3 Units as per the syllabus & contact hours and the student will have to answer 5 full questions, selecting 2 full questions from Unit - I & Unit – II and 1 full question from Unit – III.

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COMPUTER NETWORK AND COMMUNICATION

Course Code	21IS502	CIE Marks	50
Teaching Hours /Week (L:T:P)	3:0:2	SEE Marks	50
Total Hours	39T+26L	Credits	4

Course Learning Objectives (CLO)

This course will enable students to:

1. Outline the concepts of basic data communications and networking.
2. Explain the idea of signal transmission.
3. Understand the basic of data link layer functionalities and protocols.
4. Study the importance of network layer and differentiate various routing algorithms
5. Acquire the knowledge of working of transport layer, its protocols and some application layer protocols.

UNIT – I

Introduction to data communications: Components, Networks, Network Types, Protocol Layering, TCP/IP Protocol Suite, The OSI Model.
Physical Layer: Signals, Signal Impairment, Digital Transmission, Analog Transmission, Multiplexing.
Data-Link Layer: Data-link control: Framing, Error Control.
Media Access Protocols: Carrier Sense Multiple Access, CSMA/CD. Link-Layer Addressing: Three Types of Addresses
Local Area Networks: Ethernet, Standard Ethernet Frame Format. **15 Hours**

UNIT – II

Network Layer: Data Transfer: Services, Packet Switching, Performance, IPv4: IPv4 Addressing, Main and Auxiliary Protocols. IPv6: IPv6 Addressing, The IPv6 Protocol.

Network Layer: Routing of Packets: General Idea, Least-Cost Routing, Routing Algorithms: Distance-Vector Routing, Link-State Routing, Path-Vector Routing, OSPF, BGP4, Multicast Routing: Unicasting, Multicasting, Distance Vector Multicast Routing Protocol. IGMP. **15 Hours**

UNIT – III

Transport Layer: Transport-Layer Services, Transport-Layer Protocols, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Stream Control Transmission Protocol (SCTP). (Chapter 9)
Application Layer: Introduction, Client/Server Paradigm, Standard Applications. **9 Hours**

Course Outcomes (COs):
Upon completion of this course, students will be able to:
1. Describe the basics of Data Communication and understand the working of signals in physical layer.
2. Understand the working of data link layer, the protocols and differentiate the types of LAN.
3. Comprehend the basic data transfer in network layer.
4. Distinguish between various routing algorithms.
5. Portray the transport layer protocols and the list some of the services in application layer.

Mapping Levels of COs to POs															
COs	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3			3							2	3	3	
CO2	3	3			3							2	3	3	
CO3	3	3			3							2	3	3	
CO4	3	3			3							2	3	3	
CO5	3	3			3							2	3	3	

TEXTBOOK:
1. Data Communications and Networking with TCP/IP Protocol Suite, Behrouz A. Forouzan, 6th Edition, 2022, McGraw Hill, ISBN 978-1-26-436335-3

REFERENCE BOOKS:
1. Computer Networks by Andrew S. Tanenbaum (Fifth Edition), Pearson Education.
2. Data Communication and Networking by Behrouz A. Forouzan (Fifth Edition), Tata McGraw Hill.
3. Computer Networking. A Top-down Approach, James F. Kurose, Keith W. Ross, Pearson, ISBN: 1292153598, 2017.
4. Data and Computer Communications, 10th Edition, William Stallings, Pearson Education, 2013, ISBN: 0133506487,9780133506488.
5. Data and Computer Communication, 8th Edition, William Stallings, Prentice Hall, 0132433109, 2007.
6. An Introduction to Computer Networks, Peter L Dordal, Open Book, http://intronetworks.cs.luc.edu/ 2020.
7. William A. Shay, "Understanding Data Communications and Networks", 2nd Edition, Thomson.

E-Books / Online Resources:
1. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
2. https://www.guru99.com/data-communication-computer-network-tutorial.html

MOOCs:

1. https://nptel.ac.in/courses/106105082
2. https://onlinecourses.nptel.ac.in/noc22_ee61/
3. https://www.coursera.org/learn/fundamentals-network-communications

Suggested list of experiments

PART-A (Experiments using NS-2/NS-3)

1. Simulate peer-to-peer communication between a client and a server using Point-to-Point protocol. Apply NetAnim software to demonstrate the scenario graphically. Analyze packet parameters by creating trace file using Ascii trace metrics.
2. Simulate to implement a bus topology using Point-to-Point protocol between a client and a LAN with 4 nodes. The LAN use CSMA during packet transmission. Apply NetAnim software to demonstrate the scenario graphically. Analyze packet parameters by creating trace file using Ascii trace metrics.
3. Simulate peer-to-peer communication between a client and a server using CSMA protocol. Apply NetAnim software to demonstrate the scenario graphically. Analyze packet parameters by creating trace file using Ascii trace metrics.
4. Simulate the transmission of ping messages over a network topology consisting of 3 nodes n0, n1 and n2, where node n0 and n1 are the pingers.
5. Simulate to implement the star topology using Point-to-Point protocol. ApplyNetAnim software to demonstrate the scenario graphically. Analyze packet parameters by creating trace file using Ascii trace metrics.

PART-B (Experiments using C/C++/Java/Python)

1. Write a program for error detecting code using CRC-CCITT (16-bits).
2. Design a program in which sender module should count the no of bytes in the frame and receive module should display each frame received.
3. Design a program to implement bit stuffing, encoding and decoding concept in data link layer.
4. 4. Write a program for distance vector algorithm to find suitable path for transmission.
5. Design a program to implement client server model (TCP) using socket programming.
6. Design a program to implement client server model (UDP) using socket programming.
7. Design a program for congestion control using leaky bucket algorithm.

SEE Scheme

There will be **8** questions of **20** marks each in the question paper divided into **3** units as per the syllabus & contact hours and the student will have to answer **5** full questions, selecting **two full** questions from **first two unit** and **one full** question from **third** unit.

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DATABASE MANAGEMENT SYSTEMS

Course Code	21IS503	CIE Marks	50
Teaching Hours /Week (L:T:P)	3-0-0	SEE Marks	50
Total Hours	39	Credits	3

Course Learning Objectives:

This Course will enable students to:

1. Understand the concept of databases, and apply Entity-Relationship Modeling for creating and designing databases for the real world scenarios.
2. Develop structured query language (SQL) statements.
3. Optimize a database using Normalization Rules.
4. Understand and apply database design concepts and algorithms.
5. Analyze the issues associated with Transaction Processing and understand MongoDB database concepts for managing big data.

UNIT – I

INTRODUCTION TO DATABASE SYSTEMS:

Introduction, Characteristics of the Database approach, Actors on the scene, Data models, Schemes and Instances, Three Schema Architecture and Data Independence. (Refer Text 1)

ENTITY-RELATIONSHIP MODEL:

Introduction of Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the, ER Design for the COMPANY Database; ER Diagrams, Naming Conventions and Design Issues. (Refer Text 1)

RELATIONAL MODEL AND RELATIONAL ALGEBRA:

Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations and Dealing with Constraint Violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping. (Refer Text 1)

15 Hours

UNIT – II

SQL-THE RELATIONAL DATABASE STANDARD:

SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Schema Change Statements in SQL; Basic Queries in SQL; More Complex SQL Queries; Insert, Delete and Update Statements in SQL; Views (Virtual Tables) in SQL. Triggers and stored procedures(Refer Text 1)

DATABASE DESIGN:

Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Properties of Relational Decompositions. (Refer Text 1)

15 Hours

UNIT – III

TRANSACTION MANAGEMENT:

Inference Rules; Equivalence and Minimal Cover; The ACID Properties; Two-Phase locking techniques for concurrency control.(Refer Text 1)

INTRODUCTION TO MONGODB:

Introduction to MongoDB, Data types in MongoDB, MongoDB query language (CRUD operations).

9 Hours

Course Outcomes:

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

1. Apply the concepts of Databases, Data Management Systems and ER Modeling to Design a Database.
2. Apply the concepts of Relational Models and Relational Algebra to build database queries.
3. Develop and Examine data base queries using Structured Query Language.
4. Design, Develop and Examine databases by applying the concepts of Normalization and Design algorithms.
5. Outline the issues associated with Transaction Processing and apply the concept of MongoDB databases for managing big data.

Mapping Levels of COs to POs / PSOs														
COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	2	3											3
CO2	2	3												3
CO3	2	3												3
CO4	1	2	3											3
CO5	1	2												3

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXTBOOKS:

1. Elmasri and Navathe, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2003.
2. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", First Edition, Wiley, 2015.

REFERENCE BOOKS:

1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems" ,Third Edition, McGraw-Hill, 2003.
2. Silberschatz, Korth and Sudharshan: "Data base System Concepts", Sixth Edition, Mc-GrawHill, 2010.
3. C.J. Date, A. Kannan, S. Swaminathan: "An Introduction to Database Systems", Eight Edition, Pearson Education, 2006.
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Pearson Education, Inc. 2012.

E-Books / Online Resources:

1. http://agce.sets.edu.in/cse/ebook/DBMS%20BY%20RAGHU%20RAMAKRISHNAN.pdf
2. http://iips.icci.edu.iq/images/exam/databases-ramaz.pdf

MOOC:

1. http://nptel.ac.in/courses/106106093/
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/lecture-notes/

SEE Scheme

There will be **8** questions of **20** marks each in the question paper divided into **3** units as per the syllabus & contact hours and the student will have to answer **5** full questions, selecting **two full** questions from **first two unit** and **one full** question from **third** unit.

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OPERATING SYSTEMS

Course Code	21IS504	CIE Marks	50
Teaching Hours /Week (L:T:P)	3-0-0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to:

1. Explain the concepts, principles and services of operating system.
2. Identify fundamental operating system concepts such as processes, inter-process communication, threads, CPU scheduling and demonstrate them.
3. Assess the need of concurrency and synchronization and apply them to write concurrent programs and analyze the cause for the occurrence of deadlocks and determine solutions to overcome the deadlocks.
4. Study the concepts of main memory and virtual memory allocation methods and demonstrate them.
5. Analyze the need for file system concepts, directory implementation and disk scheduling algorithms and demonstrate them.

UNIT – I

Operating System structure: Operating System Services, User and Operating System interface, System calls, System Services, Linkers and Loaders, **Process Management:** Process concept; Process scheduling; Operations on processes; Inter-process communication. **Threads:** Multithreading Models. **CPU Scheduling:** Basic concepts, Scheduling criteria, Scheduling algorithms, Thread scheduling **15 Hours**

UNIT – II

Process Synchronization: The Critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Monitors, Classical problems of synchronization. **Deadlocks:** System model; Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, avoidance, detection and recovery from deadlock. **Main Memory:** Paging, Structure of page table, Swapping. **14 Hours**

UNIT – III

Virtual Memory: Demand paging, Copy-on-write, Page replacement, Allocation of frames. Implementing File System: File system Concepts, File System Structure, Operations and implementation, Directory implementation, Allocation methods, Free space management. disk scheduling algorithms **10 Hours**

Course Outcomes:

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

1. ***Recognise*** the structural components of operating system
2. ***Demonstrate*** the creation and termination of the processes, threads and CPU scheduling algorithms.
3. ***Illustrate*** critical section problem and ***demonstrate*** the Peterson's solution. ***Investigate*** the Deadlock condition and ***determine*** the solution to avoid the deadlocks.
4. ***Summarize*** Main memory and Virtual Memory allocation methods and **prepare** a page replacement schedule to the given set of page requirement request.
5. **Classify** file systems based on operations and implementations and ***illustrate*** the disk scheduling algorithms.

Mapping Levels of COs to POs / PSOs															
COs	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2												1	2
CO2	3	2											1	2	3
CO3	3	2											1	2	3
CO4	3	2											1	2	3
CO5	3	2											1	2	3

3: Substantial (High) 2: Moderate (Medium) 1: Poor (Low)

TEXTBOOK:

1. Operating System Concepts, Abraham Silberschatz, Greg Gagne, Peter B. Galvin, 10th Edition, John Wiley & Sons, 2018, ISBN: 9781119320913.

REFERENCE BOOKS:

1. D.M Dhamdhere: Operating systems - A concept based Approach, 2nd Edition, Tata McGraw- Hill, 2002.
2. P.C.P. Bhatt: Operating Systems, 2nd Edition, PHI, 2006.
3. Harvey M Deital: Operating systems, 3rd Edition, Addison Wesley, 1990.

E-Books / Online Resources:

1. http://www.uobabylon.edu.iq/download/M.S%2020132014/Operating_System_Concepts,_8th_Edition%5BA4%5D.pdf
2. http://iips.icci.edu.iq/images/exam/Abraham-Silberschatz-Operating-System-Concepts--9th2012.12.pdf

MOOCs:

1. https://freevideolectures.com/university/iit-bombay/
2. https://www.cse.iitb.ac.in/~mythili/os/

SEE Scheme

There will be **8** questions of **20** marks each in the question paper divided into **3** units as per the syllabus & contact hours and the student will have to answer **5** full questions, selecting **two full** questions from **first two unit** and **one full** question from **third** unit.

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APPLICATION DEVELOPMENT LAB

Course Code	21IS505	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2:0	SEE Marks	50
Total Hours	26	Credits	03

Course Learning Objectives:

1. Learn how to design ER and schema diagrams for the given database problems and understand the mapping structure of entity relationship to tables.
2. Program SQL queries using Data Definition and Data Manipulation Languages.
3. Program SQL queries through a variety of database problems.
4. Understand the concept of stored procedures, triggers, and cursors in developing database applications.
5. Make use of complex and advanced query concepts in the developments of real time application using the database.

List of Experiments	
1	a) Creation of a schema diagram for Employee database b) Creation of an ER diagram for Employee Database c) Creation of Employee Database using DDL commands d) Querying of Employee Database using simple DML commands
2	a) Creation of a schema diagram for Insurance database b) Creation of an ER diagram for Insurance Database c) Creation of Insurance Database using DDL commands d) Querying of Insurance Database using DML commands
3	a) Creation of a schema diagram for Bank database b) Creation of an ER diagram for Bank Database c) Creation of Bank Database using DDL commands d) Querying of Bank Database using DML commands e) Querying of Student Database using complex/Advanced DML commands
4	a) Creation of a schema diagram for Movie database b) Creation of an ER diagram for Movie Database c) Creation of Movie Database using DDL commands d) Querying of Movie Database using DML commands e) Querying of Movie Database using complex/Advanced DML commands
5	a) Creation of a schema diagram for Student database b) Creation of an ER diagram for Student Database c) Creation of Student Database using DDL commands d) Querying of Student Database using simple DML commands e) Querying of Student Database using complex/Advanced DML commands
Students must do a mini project based on database management system and demonstrate the same.	

- Create a database application using any programming language as the front end and any database software as a backend.
- For any problem selected, write the ER Diagram, apply ER-mapping rules, normalize the relations, and follow the application development process.
- All applications must be demonstrated on desktop/laptop as a stand-alone or web-based application (Mobile apps on Android/IOS are not Permitted).
- Make sure that the application developed should have a minimum of five tables, at least one trigger and one stored procedure.

Course Outcomes:

At the end of the course student will be able to

1. Make use of ER diagrams concepts to design a database for a given real world scenarios.
2. Make use of Schema diagrams concepts to design a database for a given real world scenarios.
3. Analyse abstract problems and apply a combination of hardware and software to address problems. Implement database creation using Data Definition Language (DDL) concepts.
4. Apply the DML (Data Manipulation Language) Concepts to query the Database.
5. Apply the concepts of complex queries in database environment.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓		
↓ Course Outcomes													1	2	3
CO1	1	2		2						1	1				1
CO2	1	2		2						1	1				1
CO3	2	2		2	2					1	1			3	2
CO4	2	2		2	2					1	1				2
CO5	2	2		2	2					1	1			2	2

1: Low 2: Medium 3: High

TEXTBOOK:

1. Database Systems Models, Languages, Design and Application Programming, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.

REFERENCE MATERIALS:

2. Database System Concepts- Silberschatz, Korth and Sudharshan, Sixth Edition, Mc-Graw Hill, 2010

E Resources

1. https://swayam.gov.in/nd1_noc19_cs46/preview , Database Management System, Swayam.
2. https://www.coursera.org/learn/intro-sql, Introduction to Structured Query Language (SQL), coursera.
3. https://www.coursera.org/projects/introduction-to-relational-database-and-sql, Introduction to Relational Database and SQL.

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RESEARCH METHODOLOGY AND IPR

Course Code	21HU511	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	(2:0:0:0)	SEE Marks	50
Total Hours	26	Credits	02

Course Learning Objectives:

1. To explain the significance of carrying out research work,
2. To explain the Research Problem, Review the literature.
3. To understand Research Design, methodological way of execution.
4. To understand Data Collection, and Interpretation and Report Writing.
5. To appreciate the importance of Intellectual property rights protection

UNIT - I

Research Methodology:

Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method.

Defining the Research Problem:

Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.

Reviewing the literature:

Place of the literature review in research, Bringing clarity and focus to your research problem, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed. **10 Hours**

UNIT - II

Research Design:

Need for Research Design, Features of a Good Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.

Design of Sample Surveys:

Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.

Data Collection:

Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

Interpretation and Report Writing:

Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout.

Interpretation and Report Writing (continued):

Types of Reports, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

9 Hours

UNIT - III

Introduction to Intellectual Property

Intellectual Property (IP) – Importance, Jurisprudential definition and concept of property, rights, duties and their correlation; evolution of IPR – Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications.

Agreements and Treaties

TRIPS Agreement; Madrid Agreement; Hague Agreement; WIPO Treaties; Budapest Treaty; Indian Patent Act 1970 & recent amendments – Patent (Amendment) Rules, 2017.

Basics of Patents and Concept of Prior Art

Introduction to Patents; Types of patent applications, Specifications: Provisional and complete; Forms and fees Invention in the context of "prior art". Patent databases

Patent filing procedures

National & PCT filing procedure; Status of the patent applications filed; Structure of Patent document, Precautions while patenting – disclosure/non-disclosure; Patent licensing and agreement; Patent infringement- meaning, scope, litigation. **7 Hours**

Course Outcomes:

At the end of the course, student will be able to:

1. Explain the significance of carrying out research work and identifying a research problem and perform e literature review.
2. Explain the Research Design, methodological way of execution, Data Collection, and Interpretation and Report Writing.
3. Explain the importance of Intellectual property rights and patents.

PO-CO mapping															
Course Outcomes (CO)	Program Outcomes (PO)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	1	1							3					1
CO 2	3	3	2			1	1								1
CO 3	1	1				3	2	2		3					1
1: Low 2: Medium 3: High															

TEXTBOOKS:

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg, New Age International 4th Edition, 2018
2. Research Methodology a step-by step guide for beginners. (For the topic Reviewing the literature under module 2), Ranjit Kumar, SAGE Publications Ltd . 3rd Edition, 2011
3. Study Material (For the topic Intellectual Property under module 5) Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013

REFERENCE BOOKS:

1. Research Methods: the concise knowledge base Trochim Atomic Dog Publishing 2005.
2. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.

Web links and Video Lectures (e-Resources):

1. NPTEL course material related to operations management, operations research and entrepreneurship.

SEE Scheme

There will be **8** questions of **20** marks each in the question paper divided into **3** units as per the syllabus & contact hours and the student will have to answer **5** full questions, selecting **two full** questions from **first two unit** and **one full** question from **third** unit.

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ENVIRONMENTAL STUDIES

Course Code:	21CV512	CIE Marks	50
Teaching Hours/Week (L: T: P)	1:0:0	SEE Marks	50
Total Teaching Hours	13	Credits	01

Course Learning Objectives:

1. To raise consciousness about environmental conditions and to imbibe environmentally appropriate behaviour.
2. To equip the engineering undergraduates to identify the significance of environmental practice in their daily life and in the engineering practices.
3. To make them conscious of understanding the environment where we live and act up on.

UNIT - I

Environment

Definition, significance of environmental studies- current scenario, local, regional, national and global problems. Components of environment: atmosphere, hydrosphere, lithosphere, and biosphere. Layers of atmosphere and its role.

Parts of Earth- lithosphere and its role; hydrological cycle

Eco system - Definition, ecology and environment, ecosystem components: biotic and abiotic components; ecological balance; elements of ecosystem: biotic, abiotic; producers, consumers and decomposers.

Habitat, range of life, Biome, balanced eco- system, food chain, food web and ecological pyramids

Human activities - The Anthropogenic System- human activities like growing food, building shelter and other activities for economy and social security. Soil erosion, water logging -definition. Organic farming- definition.

Natural resources

Resources - Natural resources, water, minerals, Fossil fuels and energy

Water resources - Global water resources: distribution, uses of water for irrigation, domestic and industrial purposes in India.

Quality aspects - Water quality parameters, drinking water standards for turbidity, pH value, total hardness, iron, fluoride, lead, arsenic, nitrate

Mineral resources- Metallic minerals, non-metallic minerals Fossil fuels - Coal and petroleum

Forest Wealth - Components of the forest, key benefits of forests. Deforestation-environmental effects of deforestation and remedies Sustainable development- definition, objectives

Material cycles - Carbon, Nitrogen, and Sulphur cycles. **5 Hours**

UNIT – II

Environmental pollution: Definition, harmful effects related to public health

Water pollution:

Definition, types, and sources – agriculture (pesticides and fertilizers), industry, domestic and mining, harmful effects, water borne and water induced diseases- definition, common diseases and their causatives, Fluoride problem in drinking water

Land pollution:

Definition, sources_ agriculture, housing, industry, mining, transportation. Types of municipal Solid waste Disposal (Sanitary landfills, composting, incineration (in brief) and effects

Air Pollution:

Definition, types, and sources: industry, mining, agriculture, transportation, and effects

Noise pollution:

Definition, sources, mining, industries, rail-roads, aviation, effects and control measures

Energy

Different types of energy-

Non-renewable energy; fossil fuels- coal, oil, and natural gas- brief description only. Nuclear energy- nuclear power plants,

Renewable energy: solar energy- Photovoltaic systems for street and domestic lighting, solar water heating- brief description only

Wind energy- definition, merits and demerits, Hydro power- definition, merits, and demerits.

Biomass energy- definition, sources of bioenergy, biogas, biofuels, India's position in renewable energy

Hydrogen as an alternative future source of energy- brief scope, fuel cells. **5 Hours**

UNIT - III

Current environmental issues of importance

Population growth- Definition, growth rate, effects, remedies Urbanization- Definition, environmental impacts and remedies Global warming and climate change-

Concept of greenhouse effect, sources of greenhouse gases, effects, and remedial measures of greenhouse gases

Acid rain: Definition, causes and effects, control measures. Ozone Depletion: Definition, causes, effects, and control measures.

Environmental Impact Assessment- EIA definition, objectives, and benefits of EIA. **3 Hours**

Course Outcomes:

At the end of the course student will be able to

1. Identify the significance of environmental practice in their daily life and in the Engineering practices.
2. Create awareness about environmental conditions.
3. Follow environmentally appropriate behaviour.
4. Understand the importance of their surroundings.
5. Understand Current environmental issues of importance

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓		
↓ Course Outcomes													1	2	3
CO1	-	2	-	-	-	-	-	2	-	-	-	-	1	-	-
CO2	-	-	-	1	-	-	-	-	-	1	-	-	1	-	-
CO3	1	-	-		1	-	-	-	-	-	-	-	1	-	-
CO4	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-
CO5	-	-	3	-	-	-	-	-	-	-	3	-	1	-	-

1: Low 2: Medium 3: High

TEXTBOOKS:

1. Benny Joseph, "Environmental Studies", Tata McGraw Hill Publ. Co., New Delhi, 2005.
2. Rajagopalan, R., "Environmental Studies: From Crisis to Cure", Oxford University Press, London, 2005.

REFERENCE BOOKS:

1. Balasubramanya, N and Chatwal, Gurdeep R., "Environmental Studies", Himalaya Publishing House, Mumbai, 2007.
2. Barucha, E., "Environmental Studies", University Grants Commission, New Delhi, 2004.
3. Bhatia, S. C., "Environmental Chemistry", CBS Publishers, New Delhi, 2005.
4. De, A.K. and De, A. K., "Environmental Studies", 2006.
5. Keller, Edward A., "Environmental Geology", CBS Publishers and Distributors, Delhi, 1985.

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MACHINE LEARNING

Course Code	21IS601	CIE Marks	50
Teaching Hours/Week (L: T:P:S)	3:0:2:0	SEE Marks	50
Total Hours	39	Credits	4

Course Learning Objectives:

This course will enable students to

1. Gain comprehensive knowledge about the role and significance of hypothesis in machine learning, including its design and various applications.
2. Create a model that can use to predict the class of the target variable by learning simple decision rules.
3. Explore various supervised and unsupervised learning algorithms and their usage in solving problems related to the current scenario.
4. Evaluate the performance of the machine learning models using various metrics.
5. *Explore the power of adaptive learning systems and design the system* to perform various computational tasks faster than traditional systems.

UNIT - I

Introduction:

Machine learning: what and why?- Types of machine learning, Supervised learning and Unsupervised learning. Well-Posed Learning Problems, Designing Learning Systems.

(Textbook 1: Chapter 1- 1.1-1.3, Textbook 2: Chapter: 1.1,1.2,1.3)

Applications of Machine Learning: Social Media Features, Product Recommendations, Image & Speech Recognition, Sentiment Analysis, Self-driving cars, Email Spam and Malware Filtering, Stock Market Trading, Medical Diagnosis, Online Fraud Detection, and Automatic language translation, Perspectives and Issues in Machine Learning. **(Internet resource)**

Supervised Learning-I:

Decision Tree Learning: Decision Tree representation, appropriate problems for the decision tree, basic decision tree algorithm, basics of C4.5 and issues in decision tree learning. (Textbook 2: Chapter: 3.2,3.3,3.4,3.5,3.7)

K-Nearest Neighbour: K-NN rule, Measuring Similarity, Irrelevant attributes, and scaling problems. (Textbook 3: Chapter: 3.1,3.2,3.3). **15 Hours**

UNIT – II

Supervised Learning-II:

Regression Versus classification

Regression: Linear Regression, Simple Linear Regression, Multiple Linear Regression, Polynomial Linear Regression.

Naïve Bayes classifier: Introduction, Bayes Theorem, Naive Bayes Classifier. (Textbook 2: Chapter 6.1,6.2,6.9).

Random Forest Algorithm: Working of the Random Forest Algorithm, Advantages, and Disadvantages of Random Forest Algorithm.

Unsupervised Learning: Types of unsupervised learning, Challenges in unsupervised learning, Cluster Analysis, K-means, Hierarchical Aggregation, Normalization, Dimensionality Reduction: Principal Component Analysis. (Textbook 3: Chapter 14.1,14.2,14.4).

Model Evaluation and Classification metrics: Confusion matrix, Accuracy, Precision, Recall, F1 Score, AUC curve, Regression metrics, Mean Squared Error or MSE, Root Mean Squared Error or RMSE, Mean Absolute Error or MAE, Root Mean Squared Log Error or RMSLE. (Textbook 3: Chapter 11.1,11.2,11.3).

15 Hours

UNIT – III

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptron, Basics of Backpropagation algorithm. (Textbook 2: Chapter 4.1 - 4.5.2).

Reinforcement Learning: Introduction, Learning Task, Q Learning, Nondeterministic Rewards, and Actions. (Textbook 2: Chapter 13.1 – 13.4).

Ensemble Learning: Bagging, Boosting, AdaBoost-Practical version of Boosting. (Textbook 3: Chapters: 9.1,9.2, 9.3). **9 Hours**

Suggested List of Experiments
Demonstrate importing a dataset, identifying, and handling missing values, encoding categorical data and feature scaling using machine learning libraries.
Implement the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
Demonstrate the working of Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
Construct a decision tree based on ID3 algorithm. Use an appropriate dataset for building the decision tree and apply this knowledge to classify a new sample.
Demonstrate application of Linear regression to predict the stock market prices of any organization.
Demonstrate the use of Support Vector Machine algorithm for a regression problem on any preferred dataset and evaluate the performance of the model

Write a program to implement *k*-Nearest Neighbor classification algorithm on the iris flower dataset and visualize the results.
Demonstrate image segmentation using K-means clustering algorithm and visualize the results.
Apply Hierarchical clustering on customer segmentation dataset and visualize the clusters and plot the dendrograms.
Perform Random Forest classification on Pima-Indians diabetes dataset.

Course Outcome:

On Completion of the course, the students will be able to

1. Develop an extensive understanding of the importance and impact of hypothesis in machine learning, encompassing its design and diverse range of applications.
2. Develop a predictive model capable of utilizing basic decision rules to accurately determine the class of the target variable.
3. Apply various supervised and unsupervised learning algorithms to effectively address and resolve challenges pertinent to the present situation.
4. Assess the effectiveness and efficiency of machine learning models by utilizing different evaluation metrics.
5. Achieve a deeper understanding of the capabilities of adaptive learning systems and develop a system that excels in executing diverse computational tasks.

Mapping of POs & COs:

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	2							1	1		1	1	1
CO2	2	3		3	1				1	1		1	3	2
CO3	2	3		2	1				1	1		1	3	2
CO4	2	3		2	1				1	1		1	3	2
CO5	1	1							1	1		1	1	1

3: Substantial (High) 2: Moderate (Medium) 1: Poor (Low)

TEXTBOOKS:

1. Kevin. P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
2. T. M. Mitchell, "Machine Learning", Indian Edition, McGrawHill, 1997.
3. Miroslav Kubat ,"An Introduction to Machine Learning", Second Edition

WEBSITES:

1. https://www.udemy.com/course/machinelearning/
3. https://www.coursera.org/browse/data-science/machine-learning

REFERENCE BOOKS:

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, "Machine Learning", Pearson Education
2. R.O. Duda, P. E. Hart, and D. G. Stock, "Pattern Recognition", Wiley Publications, 2001.
3. T. Hastie, R. Tibshirani, J. Friedman. "The Elements of Statistical Learning", 2nd Edition, 2008.
4. P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012.
5. K. P. Murphy, "Machine Learning: A probabilistic Perspective", MIT Press, 2012.

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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INDUSTRIAL ENGINEERING & MANAGEMENT			
Course Code	21IS602	CIE Marks	50
Teaching Hours/Week (L:T:P)	3-0-0-0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives

This Course will enable students to:

1. Get basic the management knowledge essential to make a managerial career in professional life.
2. Understand the basic managerial functions.
3. Evaluate the use of motivation and effective communication techniques
4. Solve networks of project activities and find the optimal number of days required to complete the project work.
5. Find the financial worth of different alternatives using various financial tools.

UNIT – I

Management: Meaning – Functions of Management

Forecasting: Meaning, Methods of Forecasting (Qualitative methods and Quantitative methods – simple moving average method, weighted moving average method, exponential smoothing method, simple regression model)

Planning: Meaning, steps in planning, types of planning

Organizing: Process, charts of organization

Leading: Meaning types of leadership

Controlling: Process, critical control points **15 Hours**

UNIT – II

Motivation- Meaning, Theories of motivation (Maslow, Herzberg & X and Y theories)

Communication- Model, types. Effective communication.

Project Planning Tools – Gantt (Bar) Chart.

Network Analysis – PERT and CPM - Crashing the Project completion duration using network analysis

15 Hours

UNIT – III

Managerial economics: Interest Rate Calculations, Simple Interest, Compound Interest, Effective Rate of Interest, Payback Time, Present Worth, Future Worth, Annual Worth Calculations. Depreciation – Types and Causes, Computing Depreciation (using straight line, declining and double declining methods only)

9 Hours

Course Outcomes

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

1. Explain basic managerial concept and Forecasting.
2. Describe different management functions.
3. Evaluate the use of motivation and effective communication techniques.
4. Analyse networks and to apply project management techniques and perform break even analysis of projects
5. Evaluate the financial worth of different alternatives using various financial techniques.

Mapping Levels of COs to POs / PSOs														
COs	Program Outcomes (POs)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3					3		1	1			1		
CO2	2	3				1		1	1		3	1		
CO3	2	3				1		1	1		3	1		
CO4	2	3				1			1		3			
CO5	3					1			1		3			

3: Substantial (High) 2: Moderate (Medium) 1: Poor (Low)

TEXTBOOKS :

1. Managing Engineering and Technology, 3rd Edition, Daniel L. Babcock, Lucy C Morse.
2. Management in Engineering – Principles and Practice, Second Edition, - Gail Freeman Bell, James Balkwill; Prentice Hall of India Pvt. Ltd., New Delhi – 110001.
3. Essentials of Management, Fifth Edition, - Harold Koontz, Heinz Weinrich; Tata McGraw Hill Edition, New Delhi.
4. Engineering Economics, 4th Edition, James L. Riggs, David D. Bedworth, Sabah U. Randhawa; Tata McGraw Hill Edition.
5. Industrial and Business Management, Martand T Telsang; Sulthan Chand & Company Ltd., New Delhi – 110055.

REFERENCE BOOKS:

1. Fundamentals of Financial Management, - Prasanna Chandra; Tata McGraw Hill Publishing Company Ltd, New Delhi.
2. Operation Research, - S. D. Sharma.
3. Operation Research – An Introduction", - Hamdy A Taha; Pearson Prentice Hall.
4. Organizational Behaviour, Stephen P Robbins; Prentice Hall, India.
5. Organizational Behaviour, Fred Luthans; McGraw Hill International Edition.
6. Engineering Economics ,Fourth edition- James L Riggs, Devid D, Bedworth. Sabsh U. Randhawa; Tata McGraw Hill.

SEE Scheme

There will be **8** questions of **20** marks each in the question paper divided into **3** units as per the syllabus & contact hours and the student will have to answer **5** full questions, selecting **two full** questions from **first two unit** and **one full** question from **third** unit.

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CRYPTOGRAPHY & NETWORK SECURITY

Course Code:	21IS603	CIE Marks	50
Teaching Hours/Week (L: T: P: S):	3:0:0:0	SEE Marks	50
Total Teaching Hours:	39	Credits	03

Course Learning Objectives:

To understand the fundamentals of Cryptography

1. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
2. To understand the various key distribution and management schemes.
3. To understand how to deploy encryption techniques to secure data in transit across data networks
4. To design security applications in the field of Information technology

UNIT – I

Classical Encryption Techniques: Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad.

Block Ciphers and The Data Encryption Standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, DES, Block cipher design principles, number of rounds, design of function F, key schedule algorithm, AES algorithm introduction.

Public-Key Cryptography and RSA: Principles of Public-key cryptosystems. Public-key cryptosystems. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **15 Hours**

UNIT – II

Other Public-Key Cryptosystems: Diffie-Hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, Elliptic curve cryptography, Analog of Diffie-Hellman key exchange, Elliptic curve encryption/decryption.

Key Management And Distribution: Symmetric key distribution using Symmetric encryption, Hierarchical key control, Decentralized key control, Symmetric key distribution, public key authority, public keys certificates, X-509 certificates.

User Authentication: Remote user Authentication principles, Kerberos, Remote user Authentication using Asymmetric encryption, identity management. **15 Hours**

UNIT – III

Web Security Considerations: Web Security Threats, Web Traffic Security Approaches. Secure Sockets Layer: SSL. Cipher Suites, Secure Shell (SSH).

IP Security: IP Security overview, IPSec, Security associations, IP traffic processing, Encapsulating Security payload, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes. **10 Hours**

Course Outcomes: At the end of the course student will be able to

1. Comprehend the cryptography techniques.
2. Apply the Knowledge of number theory in Public Key Crypto Systems.
3. Identify the Key management issues and resolve it.
4. Analyze the security issues in the network and solution for it.
5. Apply security mechanisms using rigorous approaches.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
↓ Course Outcomes													1	2
CO1	3	3	2											1
CO2	3	3	3											2
CO3	3	3												1
CO4	3	3	2											2
CO5	3	3												1

1: Low 2: Medium 3: High

TEXTBOOK:

1. William Stallings: Cryptography and Network Security, Pearson 6th Edition, 2013.

REFERENCE BOOKS:

1. V K Pachghare: Cryptography and Information Security, PHE, 2013.

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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NETWORK SECURITY LAB

Course Code:	21IS604	CIE Marks	50
Teaching Hours/Week (L: T: P: S):	0:0:2:0	SEE Marks	50
Total Teaching Hours:	26	Credit	01

Course Learning Objectives:

1. Develop code for classical Encryption Techniques to solve the problems.
2. Build cryptosystems by applying symmetric and public key encryption algorithms.
3. Construct code for authentication algorithms.
4. Develop a signature scheme using Digital signature standard.
5. Demonstrate the network security system using open-source tools

List of Experiments	
1.	Implementation of Substitution and Transposition Techniques i. Caesar Cipher ii. Playfair Cipher iii. Hill Cipher iv. Vigenere Cipher v. Rail Fence Cipher
2.	Implementation of Cryptographic Algorithms a. DES b. RSA Algorithm c. Diffie-Hellman Algorithm

	d. MD5 e. SHA-1
3.	Implement the SIGNATURE SCHEME - Digital Signature Standard
4.	Providing secure data storage, secure data transmission and creating digital signatures.
5.	Setup a Honey Pot and Monitor the Honeypot on Network.
6.	Installation of rootkits and study the variety of options.
7.	Perform wireless audit on an access point or a router and decrypt WEP and WPA (Net Stumbler).
8.	Demonstrate intrusion detection system.

Course Outcomes: At the end of the course student will be able

1. to develop code for classical Encryption Techniques to solve the problems.
2. to Build cryptosystems by applying symmetric and public key encryption algorithms
3. to Construct code for authentication algorithms.
4. to Develop knowledge of securing web applications
5. to Demonstrate the network security system using open- source tools

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
↓ Course Outcomes													1	2
CO1	3	3	3											
CO2	3	3	3											
CO3		3	3											
CO4			2	3										
CO5		3		2	3									

1: Low 2: Medium 3: High

TEXTBOOK:

1. William Stallings: Cryptography and Network Security, Pearson 6th Edition, 2013.

REFERENCE BOOKS:

1. V K Pachghare: Cryptography and Information Security, PHE, 2013.

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MINI PROJECT			
Course Code	21IS605	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2:0	SEE Marks	50
Total Hours	26	Credits	2

Course Learning Objectives:

1. The student should complete a mini project using the knowledge gathered from the courses successfully completed.
2. Conceptual development of a new idea in the field of Information Science and Engineering.

Student need to choose a problem statement pertaining to an area and a project solution has to be developed under the guidance of a faculty mentor.
Student will be evaluated based on

2. Problem Statement and objectives
3. Literature Review
4. System Design
5. Implementation and Testing
6. Demonstration
7. Report

Course Outcomes: At the end of the course student will be able to

1. Design and model a system based on the requirements; implement, test and analyse the performance of the system.
2. Record and document the work done.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12		PSO↓	
↓ Course Outcomes													1	2	3
CO1	3	2	2	3	3	2	2	2	3	1	3	3	3	3	3
CO2	1	1	1	1	1	1	1	1	3	3	1	3	3	3	3

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INTERNET OF THINGS

Course Code:	21ISA51	CIE Marks	50
Teaching Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Teaching Hours	26	Credits	01

Course Learning Objectives:

1. Assess the genesis and impact of IoT applications, architectures in real world.
2. Illustrate diverse methods of deploying smart objects and connect them to network.
3. Compare different Application protocols for IoT.
4. Infer the role of Data Analytics and Security in IoT.
5. Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.

List of Experiments	
1.	What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact (Chapter 1) Lab Experiment: Simple Blinking of Arduino and LED Blinking Arduino
2.	Convergence of IT and IoT, IoT Challenges 9Chapter 1), IoT Network Architecture and Design, Drivers behind New Network Architectures (Chapter 2) Lab Experiment: Arduino Button Based LED Blinking along with Counting number of times button Pressed
3.	Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack. (Chapter 2) Lab Experiment: Arduino Sense the Temperature using any Temperature Sensor
4.	Sensors, Actuators, and Smart Objects, Sensor Networks (chapter 3), Connecting Smart Objects Communications Criteria, IoT Access Technologies. (Chapter 4) Lab Experiment: Arduino read the serial Monitor and display value of a sensor

5.	IP as the IoT Network Layer, The Business Case for IP, The need for optimization (Chapter 5), Lab Experiment: Use Arduino to connect to the Internet using Emulated Platform
6.	IoT Application Transport Methods. Data and Analytics for IoT. (Chapter 6 and 7) Lab Experiment: Connect to cloud using Blynk Framework and Arduino + Sense the Temperature from the Arduino and display to the cloud.
7.	Edge Streaming Analytics, Network Analytics, Securing IoT (Chapter 7 and 8), A Brief History of IOT Security, and Common Challenges in OT Security. Lab Experiment: Control Arduino from the Blynk terminal and display the value entered from the cloud to the console
8.	Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary (Chapter 8) Lab Experiment: Using Blynk cloud display action-based Proximity Sensor.
9.	IoT Physical Devices and Endpoints - Arduino UNO, Introduction to Arduino, Arduino UNO. IoT Physical Devices and Endpoints - Raspberry Pi: (second text book Chapter 7) Lab Experiment: Using the Nodemcu and connecting to Wi-Fi
10.	Introduction to Raspberry Pi, About the Raspberry Pi Board: Hardware Layout (Second text book Chapter 8) LAB Experiment: Interfacing the Nodemcu with Cloud like Ubidots, Blynk, and Adafruit etc.
11.	Operating Systems on Raspberry Pi, Configuring Raspberry Pi, Programming Raspberry Pi with Python (Second Text book chapter 8) LAB Experiment: Measuring GPS coordinates from the Device and displaying it to Nodemcu.
12.	Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Arduino, Accessing Temperature from DS18B20 sensors. (Second text book Chapter9). Lab Experiment: Raspberry Pi introduction + Connecting Raspberry Pi connection to Internet.
13.	Remote access to Raspberry Pi, Smart and Connected Cities (Second text book Chapter 10) Lab Experiment: Connecting Raspberry Pi to other Edge devices for communication

Course Outcomes:

At the end of the course student will be able to

1. Compare and contrast the deployment of smart objects and the technologies to connect them to the network.
2. Analyse the role of IoT protocols for efficient network communication.
3. Apply different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.
4. Apply the knowledge of installation of Operating systems on Raspberry PI and its configuration.
5. Analyse the role of Smart cities and its importance with IoT.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
↓ Course Outcomes													1	2
CO1	2	3	2											2
CO2	2	3	1									1		2
CO3	2	3	3	2								2		3
CO4	2	3	1											2
CO5	2	2	1									1		1

REFERENCE BOOKS:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands - on- Approach)", First Edition, VPT, 2014. (ISBN: 978-8173719547)
2. Raj Kamal, "Internet of Things: Architecture and Design Principles",1st Edition, McGraw-Hill Education, 2017. (ISBN: 978-9352605224)

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INNOVATION/ENTREPRENEURSHIP/SOCIAL BASED INTERNSHIP (4 Weeks)			
Course Code	21INT61	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	-	SEE Marks	50
Total Hours	-	Credits	03

Course Learning Objective:

1. This course is meant to provide students an opportunity to be involved in Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the institution; contribution at incubation/ innovation /entrepreneurship cell of the institution; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working for consultancy/ research projects within the institution and Participation in all the activities of Institute's Innovation Council.

Course Outcomes:

1. Experience the working in Inter / Institutional activities
2. Work in teams and communicate efficiently both written and oral.
3. Develop the ability to do work in different activities, which will provide the necessary understanding and contribute to the same and provide a foundation to undergo higher level training in subsequent internships.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓		
↓ Course Outcomes													1	2	3
CO1	3	1	-	-	1	-	-	-	2	3	1	-	-	-	-
CO2	3	1	-	-	1	-	-	-	2	3	1	-	-	-	-
CO3	3	1	-	-	1	-	-	-	2	3	1	-	-	-	-
1: Low 2: Medium 3: High															

ELECTIVES
IT MANAGEMENT STREAM

INFORMATION STORAGE MANAGEMENT			
Course Code	21ISE111	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Describe about different types of computer storage and its working.
2. Focus on the latest technologies which are used for data protection and storage.
3. Analyze requirement and suggest appropriate storage technology to store the data.
4. Use and compare different storage techniques and its pros and cons.
5. How computer storage techniques have evolved.

UNIT – I

STORAGE SYSTEM: INTRODUCTION TO INFORMATION STORAGE

Information Storage, Evolution of Storage and Architecture, Data Center Infrastructure, Virtualization and Cloud Computing. **(T1: 1.1-1.4)**

DATA PROTECTION

RAID: RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison, Hot Spares. **(T1: 3.1-3.7)**

INTELLIGENT STORAGE SYSTEMS: Components of an Intelligent Storage System, Storage Provisioning, Types of Intelligent Storage Systems. **(T1: 4.1-4.3)**

STORAGE NETWORKING TECHNOLOGIES:

Direct-Attached Storage and Introduction to SCSI: Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, SCSI Command Model. **(T2: 5.1-5.5)**

11 Hours

UNIT – II

STORAGE NETWORKING TECHNOLOGIES: FIBRE CHANNEL STORAGE AREA NETWORKS

Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fibre Channel Architecture, Fabric Services, Switched Fabric Login Types, Zoning, FC SAN Topologies, Virtualization in SAN. **(T1: 5.1-5.11)**

NETWORK-ATTACHED STORAGE

General-Purpose Servers vs. NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operations, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance, File-Level Virtualization. **(T1: 7.1-7.9)**

IP SAN: iSCSI, FCIP. **(T1: 6.1-6.2)**

OBJECT-BASED AND UNIFIED STORAGE

Object-Based Storage Devices, Content-Addressed Storage, CAS Use Cases, Unified Storage.
(T1: 8.1-8.4)

14 Hours

UNIT – III

BUSINESS CONTINUITY: INTRODUCTION TO BUSINESS CONTINUITY

Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions. **(T1: 9.1-9.6)**

BACKUP AND RECOVERY

Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Targets. **(T1: 10.1-10.10)**

CLOUD COMPUTING

Cloud Enabling Technologies, Characteristics of Cloud Computing, Benefits of Cloud Computing, Cloud Service Models, Cloud Deployment Models, Cloud Computing Infrastructure, Cloud Challenges, Cloud Adoption Considerations. **(T1: 13.1-13.8)**

SECURING THE STORAGE INFRASTRUCTURE

Information Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking. **(T1: 14.1-14.4)**

14 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Outline the computer storage techniques evolution.
2. Explain the latest technologies of storage.
3. Illustrate and compare storage techniques.
4. Analyze requirements and suggest the appropriate storage technology.
5. Apply the techniques to secure and protect the data.

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C11.1	3	2												1
C11.2	3	2												2
C11.3	3	2	1											2
C11.4	3	2	1											2
C11.5	2	3												2

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOKS:

1. Information Storage and Management: Storing, Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments, 2nd Edition, Published by John Wiley & Sons, Inc.
2. Information Storage and Management by EMC Education Services.

REFERENCE BOOKS:

1. Storage Networks Explained by Ulf Troppen, Rainer Erkens, Wolfgang Muller.
2. Storage Networks by Robert Spalding.

E-RESOURCE:

1. http://nptel.ac.in/courses/106108058/

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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TOTAL QUALITY MANAGEMENT FOR SUSTAINABLE GROWTH			
Course Code	21ISE112	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This course will enable students:

1. To gain a thorough understanding of Quality and features of quality.
2. To gain knowledge of various quality procedures..
3. To explore the fundamentals of TQM tools
4. To learn about the fundamental of quality audit.
5. To learn about various statistical tools required to access quality.

UNIT – I

Introduction – Evolution of quality, Definition, Concept and Features of TQM, Eight building blocks of TQM. (T1:1,3)

TQM thinkers and Thought – Juran Trilogy, PDSA cycle, 5S, Kaizen, Crosby's theory on Quality Management, **Quality Performance Excellence Award-** Deming Application Award, European Quality Award, Malcolm Baldrige National Quality Award. (T2:5) **15 Hours**

UNIT – II

TQM tools- Benchmarking: Definition, concepts, benefits, elements, reasons for benchmarking, process of benchmarking, FMEA, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept and need. (T2:7)

Six Sigma- Features of six sigma, Goals of six sigma, DMAIC, Six Sigma implementation. (T1:7) **12 Hours**

UNIT – III

Statistical Process Control- Central Tendency, The seven tools of quality, Normal curve, Control charts, Process Capability. (T2:15)

Quality Systems- ISO 9000, ISO 9000:2000, ISO 14000, other quality systems. (T1:1, T2:8)

Introduction to Sustainable Development: Definitions and principles of Sustainable Development, History and emergence of the concept of Sustainable Development, Millennium Development Goals: Status (global and Indian), Impacts on approach to development policy and practice in India, future directions. (T3:1 and Class Slides)

12 Hours

Course Outcomes:

Students will be able to:

1. Understand the various approaches of TQM
2. Identify and use appropriate tools and techniques for controlling, improving and measuring quality
3. Analyse customer needs and perceptions of various tools utilization for quality improvement
4. Apply statistical tools for continuous improvement of systems
5. Apply the tools and technique for effective implementation of TQM

Mapping of POs & COs:-

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2
CO1	1	2											1	2
CO2	1	3											1	2
CO3	1	3											1	2
CO4	1	3											1	2
CO5	1	3											1	2

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOK:

1. Poornima M Charantimath, "Total Quality Management", Pearson Third Edition
2. Dale H. Besterfiled, et at., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint 2006..
3. Kirkby. J, O'Keefe P. and Timberlake, "Sustainable development" Earth Scan Publication, London, 1996.

REFERENCE BOOKS:

1. H.Lai, Lt. Gen ,Wiley Eastern Limited, 1990 , Total Quality Management
2. Bounds Greg , McGraw , Beyond Total Quality Management
3. Kanishka Bedi, Oxford Higher Education, Quality Management
4. James R.Evans and Williuam M Lindsay, Managing for Quality and Performance Excellence ,9th edition, Publisher Cengage Learning.

WEB-RESOURCES

1. http://www.evans.swlearning.com s
2. www.cengage.com/international

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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iOS APP DEVELOPMENT USING XCODE AND SWIFT			
Course Code	21ISE113	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to:

1. **Describe** the iOS interface builder and various UI elements.
2. **Develop** basic iOS App using various UI elements of Interface Builder
3. **Understand** the core data structure, system utilities and application design patterns
4. **Build** iOS App with IBactions, tables , navigation, segues and transitions.
5. **Develop** application to demonstrate networking, storing retrieving and modifying Data

UNIT – I

INTRODUCTION TO DEVELOPER TOOLS

Introduction to macOS; Introduction to Xcode and Swift.; Introduction to Interface Builder; New project setup in Xcode – Using Templates, Creating Projects and Playground, and Workspaces; Interface Builder to design and create UI of your app – introduction to various UI elements of Interface Builder; Cloning Projects; iOS simulator

INTRODUCTION TO iOS

App user interface designing – mobile UI Layout (Layout, View) UI Control (TextView, EditText, Button,ImageButton,ToggleButton,RadioGroup,RadioButton,CheckBox,ProgressBar,Spinner,DayPicker,TimePicker), Draw-able, Menu(Option, Context, Popup).

15 Hours

UNIT – II

CORE FOUNDATION, SYSTEM UTILITIES AND APPLICATION PATTERNS,

Loops and conditional statements, Array, Dictionaries, Data, String, Numbers etc; Classes and Structures; Handling JSON Working with Files, Date/Calendar utilities, Preferences; Model View Controller (MVC) Design Pattern, IBOutlets, IBActions and linking various elements of UI, Subclassing and Delegation, Extensions and Protocols.

USER INTERFACE DEVELOPMENT

iOS User Interface (UI) design fundamentals iOS ; The view hierarchy – Views, Windows; Navigation View and Tab Bars; Text and Web Views; Alert Views and Action Sheets; Multi-touch, taps and gestures; Table views – delegates and data sources, view styles, custom cells; UIPickerview and UIDatePicker; Autolayout and setting constraints; Storyboards – adding scenes, segues, transitions

15 Hours

UNIT – III

NETWORKING

Network frameworks to access data on the Internet; JSON Handling; NSDataTask, NSURLSession; Webviews;

CORE DATA

Overview of Core Data; Managed Objects; Persistent Store Coordinator; Entity Descriptions; Retrieving and Modifying Data

9 Hours

Course Outcomes:

At the end of the course the student will be able to:

1. **Understand** the iOS developing tool like Xcode and Swift, projects, playground and iOS Emulator.
2. **Design** simple iOS app using the fundamental UI elements, Layout and Views
3. **Apply** the basic data structures, MVC design patterns, delegates, protocols and structures and classes to build more advanced iOS app
4. **Develop** apps that uses advanced UI components like tables, different views and layouts and multiple screens.
5. **Apply** the networking APIs and database APIs to design Apps that work real-time data.

Mapping Levels of COs to POs / PSOs														
COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3		1	1		2	2	1	2	1	2	3
CO2	3	3	3		1	1		2	2	1	2	1	2	3
CO3	3	3	3		1	1		2	2	1	2	1	2	3
CO4	3	3	3		1	1		2	2	1	2	1	2	3
CO5	3	3	3		1	1		2	2	1	2	1	2	3

3: Substantial (High) 2: Moderate (Medium) 1: Poor (Low)

TEXTBOOKS:

1. Matt Neuburg, "iOS 13 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa" , Basics 1st Edition
2. Serhan Yamacli, "Beginner's Guide to iOS 13 App Development Using Swift 5.1: Xcode, Swift and App Design Fundamentals" 2019 edition.

REFERENCE BOOKS:

1. Kevin J McNeish, "iOS App Development for Non-Programmers Series: The Series on How to Create iPhone & iPad Apps" , 2012 Edition.
2. Jesse Feiler, "iOS App Development for Dummies", 2014 Edition.

E-Books / Online Resources:

1. https://developer.apple.com/swift/
2. https://developer.apple.com/videos/
   https://code.tutsplus.com/series/learn-ios-sdk-development-from-scratch--mobile-14536

MOOC:

1. https://www.coursera.org/courses?query=ios%20app%20development
2. https://www.udemy.com/topic/ios-development/

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY			
Course Code	21ISE114	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to:

1. Principles of management, organization and entrepreneur.
2. Discuss on planning, staffing, ERP and their importance.
3. Infer the importance of intellectual property rights and relate the institutional support.

UNIT – I

INTRODUCTION - Meaning, nature and characteristics of management, scope and Functional areas of management, goals of management, levels of management, brief overview of evolution of management theories. Planning- Nature, importance, types of plans, steps in planning, Organizing- nature and purpose, types of Organization, Staffing- meaning, process of recruitment and selection.(T1)
DIRECTING AND CONTROLLING- meaning and nature of directing, leadership styles, motivation Theories, Communication- Meaning and importance, Coordination meaning and importance, Controlling- meaning, steps in controlling, methods of establishing control.(T4)

15 Hours

UNIT – II

ENTREPRENEUR – Meaning of entrepreneur, characteristics of entrepreneurs, classification and types of entrepreneurs, various stages in entrepreneurial process, role of entrepreneurs in economic development, entrepreneurship in India and barriers to entrepreneurship. Identification of business opportunities, market feasibility study, technical feasibility study, financial feasibility study and social feasibility study.(T4)
PREPARATION OF PROJECT AND ERP - meaning of project, project identification, project selection, project report, need and significance of project report, contents, formulation, guidelines by planning commission for project report.(T4)

15 Hours

UNIT – III

ENTERPRISE RESOURCE PLANNING: Meaning and Importance- ERP and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation.(T2)
MICRO AND SMALL ENTERPRISES: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in establishing micro and small enterprises. Institutional support: MSME-DI, NSIC, SIDBI, KIADB, KSSIDC, TECSOK, KSFC, DIC and District level single window agency, Introduction to IPR.(T3)

9 Hours

Course Outcomes:

1. Explain the basic concepts of management, planning, Organizing and Staffing.
2. Summarize the appropriate leadership styles, motivation theories, communications, Coordination and controlling, methods
3. Interpret the meaning of entrepreneur, entrepreneurship and role in economic development on India. Along with Identification of business opportunities and feasibility study
4. Inferring the new ideas, prepare project report based on guidelines of planning commission by utilizing the resources available effectively through ERP
5. Explain the IPRs and institutional support in Micro and Small Enterprises as per the Indian Industrial Policy 2007

Mapping Course Outcomes with Programme Outcomes:

Course Outcomes mapping to Program Outcomes														
POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO2
CO1	1	1					2	2						
CO2						2	2	2	2	2				1
CO3	1	2	3			2			2			2		1
CO4	1	2								2	2			
CO5	1	2				2	2	2			2	2		

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOKS:

1. Principles of Management -P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4th / 6th Edition, 2010.
2. Dynamics of Entrepreneurial Development & Management -Vasant Desai Himalaya Publishing House.
3. Entrepreneurship Development -Small Business Enterprises -Poornima M Charantimath Pearson Education – 2006.
4. Management and Entrepreneurship – Kanishka Bedi- Oxford University Press-2017.

REFERENCE BOOKS:

1. Management Fundamentals -Concepts, Application, Skill Development Robert Lusier– Thomson.
2. Entrepreneurship Development -S S Khanka -S Chand & Co.
3. Management -Stephen Robbins -Pearson Education /PHI -17th Edition, 2003

ADDITIONAL STUDY MATERIAL & E-BOOKS:

1. Iyer, P.P., Engineering Project Management with Case Studies, Vikas Publishing, New Delhi, 2009.
2. Zikmund, W.G., Business Research Methods, 5th Edition, New York, The Dryden Press, Harcount Publishers, 1997.
3. M Govindarajan and S. Natarajan, Principles of Management, Eastern Economy Edition, 2005.

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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SOFTWARE ENGINEERING AND DEVELOPMENT STREAM

C# AND .NET TECHNOLOGIES			
Course Code	21ISE121	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

1. Inspect Visual Studio programming environment and toolset designed to build applications for Microsoft Windows
2. Understand Object Oriented Programming concepts in C# programming language
3. Interpret Interfaces and define custom interfaces for application.
4. Build custom collections and generics in C#
5. Construct events and query data using query expressions

UNIT - I

Introducing Microsoft Visual C# and Microsoft Visual Studio 2015: Welcome to C#, Working with variables, operators and expressions, Writing methods and applying scope, Using decision statements, Using compound assignment and iteration statements, Managing errors and exceptions T1: Ch 1 – Ch 6
Understanding the C# Object model: Creating and Managing classes and objects, Understanding values and references, Creating value types with enumerations and structures, Using arrays T1: Ch 7 to 10;

14 Hours

UNIT – II

Understanding parameter arrays, Working with inheritance, Creating interfaces and defining abstract classes, Using garbage collection and resource management. **T1: Ch 11 to 14**
Defining Extensible Types with C#: Implementing properties to access fields, Using indexers, Introducing generics, Using collections **T1: Ch 15 to 18** **15 Hours**

UNIT – III

Enumerating Collections, Decoupling application logic and handling events, Querying in-memory data by using query expressions, Operator overloading **T1: Ch 19 to 22**

10 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Develop and execute C# programs in Visual Studio 2015 IDE.
2. Apply the knowledge of object orientation, exception handling, and memory management to develop efficient programs in .NET.
3. Build custom interfaces, collections, and generics in C#
4. Use operator overloading, generics, indexers, properties to create easy-to- understand programs in dot NET

Mapping of POs and COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3							1	1		1	1	1
CO2	1	3							1	1		1	1	1
CO3	2	2							1	1		1	1	2
CO4	2	2							1	1		1	2	2

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOK:

1. John Sharp, **Microsoft Visual C# Step by Step**, 8th Edition, PHI Learning Pvt. Ltd. 2016

REFERENCE BOOKS:

1. Christian Nagel, "**C# 6 and .NET Core 1.0**", 1st Edition, Wiley India Pvt Ltd, 2016. Andrew Stellman and Jennifer Greene, "**Head First C#**", 3rd Edition, O'Reilly Publications, 2013.
2. Mark Michaelis, "Essential C# 6.0", 5th Edition, Pearson Education India, 2016.
3. Andrew Troelsen, "**Prof C# 5.0 and the .NET 4.5 Framework**", 6th Edition, Apress and Dreamtech Press, 2012.

SEE Question Paper Pattern:

There will be **8** questions of **20 marks** each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5 full questions**, selecting **2 full questions** from **Unit - I** & **Unit – II** and **1 full question** from **Unit – III.**

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FULL STACK DEVELOPMENT

Course Code:	21ISE122	CIE Marks	50
Teaching Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Teaching Hours	39	Credits	03

Course Learning Objectives:

1. Design static and modern web pages using HTML5, Cascading Style Sheets (CSS) and Bootstrap.
2. Develop client-side validations using JavaScript.
3. Develop the server-side script using PHP.
4. Design the server-side database using MySQL
5. Develop the interactive web application using NodeJS framework

UNIT – I

BASICS OF HTML5, CSS AND JAVASCRIPT: Overview of HTML5, HTML5 elements, Introduction to CSS, Levels of style sheets, The Box Model, The basics of JavaScript, General syntactic characteristics, Event Handling.

BOOTSTRAP:

What is Bootstrap? Why use Bootstrap? Where to get Bootstrap? Bootstrap CDN, First Web Page with Bootstrap, Bootstrap Grid system, Contextual Colors and Backgrounds, Bootstrap Tables, Bootstrap Images, Bootstrap Jumbotron and Page Header, Bootstrap Wells, Bootstrap Alerts, Bootstrap Buttons, Bootstrap Badges and Labels, Bootstrap Progress Bars, Bootstrap List Groups, List Group with Badges, Tabs, Tabs With Dropdown Menu, Pills, Bootstrap Navigation Bar, Bootstrap Forms, Bootstrap Form Inputs, Bootstrap Media Objects, Bootstrap Carousel Plugin. **14 Hours**

UNIT - II

INTRODUCTION TO PHP:

Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, Operations and Expressions, Output, Control statements, Arrays,

Functions, Pattern Matching, Form handling, Files, Cookies, Session tracking, Database access with PHP and MySQL. **13 Hours**

UNIT – III

NodeJS: Introduction to Node.js- Installing Node.js - Node.js Modules, Node.js File System, Node.js URL Module, Node.js NPM, Node.js Events, Node.js Upload Files, Node.js Email.

NodeJS MySQL - Create Database, Create Table, Insert into, select from, Where, Order by, Delete, Drop Table, Update, Limit, Join.

Introduction to Mongo DB- Node.js MongoDB, Create Database, Create Collection, Insert, Find, Query, Sort, Delete, Drop Collection, Update, Limit, Join. **12 Hours**

Course Outcomes:

At the end of the course student will be able to

1. Describe the fundamental features of HTML5, CSS and Bootstrap and Design static web pages.
2. Design and Implement the client-side validations using JavaScript.
3. Illustrate the concept of PHP and Develop the server-side script using PHP.
4. Design the server-side database using MySQL.
5. Develop the interactive web application using NodeJS framework and MongoDB.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
↓ Course Outcomes													1	2
CO1	1	2	3											3
CO2	2	3												3
CO3	2	3												3
CO4	1	2	3											3
CO5	1	2												3

1: Low 2: Medium 3: High

TEXTBOOKS:

1. Robert W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson, 2014.
2. Jake Spurlock, "Bootstrap-Responsive Web Development", O'Reilly publications, 2013.
3. Ari Lerner, Ng-book, "The complete book on Angular JS", 2013.
4. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer Paperback – Import, 20 November 2018.
5. David Herron, Node.js Web Development: Server-side web development made easy with Node 14 using practical examples, 5th Edition, 2020

REFERENCE BOOKS:

1. M. Deitel, P.J. Deitel, A. B. Goldberg," Internet & World Wide Web: How to Program, 4e Paperback – 1 January 2009.
2. Chris Bates, "Web Programming Building Internet Applications", Third Edition, Wiley India, 2006

E Books / MOOCs/ NPTEL

1. https://www.cs.uct.ac.za/mit_notes/web_programming.html
2. http://www.multitech.ac.ug/uploads/IntroductiontoWebProgramming.pdf
3. https://www.w3schools.com/php/
4. https://www.w3schools.com/bootstrap/
5. https://www.w3schools.com/nodejs/
6. http://nptel.ac.in/courses/106106156/2
7. https://www.coursera.org/learn/web-development
8. https://www.coursera.org/learn/server-side-nodejs

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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OBJECT ORIENTED MODELING AND DESIGN			
Course Code	21ISE123	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Explain what is meant by object-oriented Modeling. Apply object-oriented Modeling techniques to the problem solving. Introduce various models that can be used to describe an object-oriented design
2. Show how the UML may be used to represent these models
3. Create class diagrams that model both the domain model and design model of a software system.
4. Create interaction diagrams that model the dynamic aspects of a software system.
5. Understand and analyse the basics of Design pattern.

UNIT – I

INTRODUCTION, MODELING CONCEPTS, CLASS MODELING

What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modelling history, Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model. **(T1: 1.1-1.5, 2.1-2.3, 3.1-3.4)**

ADVANCED CLASS MODELING, STATE MODELING

Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages. State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior. **(T1: 4.1-4.11, 5.1-5.5)**

15 Hours

UNIT – II

ADVANCED STATE MODELING, INTERACTION MODELING

Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models. Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models. **(T1: 6.1-6.6, 7.1-7.3, 8.1-8.3)**

PROCESS OVERVIEW, SYSTEM CONCEPTION, DOMAIN ANALYSIS

Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement. Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. **(T1: 10.1-10.2, 11.1-11.3, 12.1-12.5)**

15 Hours

UNIT - III

APPLICATION ANALYSIS

Application Analysis: Application interaction model; Application class model; Application state model; Adding operations. **(T1: 13.1-13.4)**

CLASS DESIGN, IMPLEMENTATION MODELING

Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example. **(T1: 15.1-15.11)**

Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing. **(T1: 17.1-17.5)** **9 Hours**

Course Outcomes:

At the end of the course the student will be able to

1. Explain the importance of object orientation, Modeling and design.
2. Apply object-oriented techniques to design class and state models.
3. Make use of UML for advanced state Modeling and interaction modelling.
4. Apply domain analysis, system conception, application analysis to refine the model and design.
5. Explain advanced concepts of object-oriented Modeling techniques.

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C34.1	1	2								1				1
C34.2	1	2	2							3				3
C34.3	1	2	2							3				3
C34.4	1	2	2							3				1
C34.5	1	2								1				1

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOK:

1. Object-Oriented Modeling and Design with UML – Michael Blaha, James Rumbaugh, 2nd Edition, Pearson Education, 2005.

REFERENCE BOOKS:

1. Rebecca Wirfs, Designing Object-oriented software, Prentice-Hall India, 1990.
2. Martin. J and Odell J, Object-oriented methods: A foundation, Prentice-Hall, 1995

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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SOFTWARE TESTING			
Course Code	21ISE124	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Differentiate the various testing techniques
2. Analyze the problem and derive suitable test cases.
3. Apply suitable technique for designing of flow graph
4. Explain the need for planning and monitoring a process

UNIT – I

BASICS OF SOFTWARE TESTING: Basic definitions, Software Quality, Requirements, Behaviour and Correctness, Correctness versus Reliability, Testing and Debugging, Test cases, Insights from a Venn diagram, Identifying test cases, Test-generation Strategies, Test Metrics, Error and fault taxonomies, Levels of testing, Testing and Verification, Static Testing.

PROBLEM STATEMENTS: Generalized pseudocode, the triangle problem, the NextDate function, the commission problem, the SATM (Simple Automatic Teller Machine) problem, the currency converter, Saturn windshield wiper.

7 Hours

FUNCTIONAL TESTING: Boundary value analysis, Robustness testing, Worst-case testing, Robust Worst testing for triangle problem, Nextdate problem and commission problem, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and
the commission problem, Guidelines and observations, Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.
T1: Chapter 1, Chapter 2, T2: Chapter 5, 6 & 7

7 Hours

UNIT – II

STRUCTURAL TESTING: Overview, Statement testing, Programme testing, Condition testing, Path testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations, Data –Flow testing: Definition-Use testing, Slice-based testing, Guidelines and observations.
TEST EXECUTION: Overview of test execution, from test case specification to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay.
T3: Section 6.2.1, T3: Section 6.2.4, T1: Chapter 9 & 10, T2: Chapter 17

7 Hours

PLANNING AND MONITORING THE PROCESS: Quality and process, Test and analysis strategies and plans, Risk planning, monitoring the process, Improving the process, the quality team.
DOCUMENTING ANALYSIS AND TEST: Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.
T2: Chapter 20, T2: Chapter 24.

8 Hours

UNIT – III

INTEGRATION AND COMPONENT-BASED SOFTWARE TESTING: Overview, Integration testing strategies, Testing components and assemblies. System, Acceptance and Regression Testing: Overview, System testing, Acceptance testing, Usability, Regression testing, Regression test selection techniques, Test case prioritization and selective execution.

5 Hours

LEVELS OF TESTING, INTEGRATION TESTING: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing, A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations.
T2: Chapter 21 & 22, T1: Chapter 12 & 13

5 Hours

Course Outcomes:

1. Explain a complete software testing life cycle, understanding of various terms and technologies used in the testing domain.
2. Summarize different Functional Testing methods.
3. Illustrate different Structural testing criteria and test execution.
4. Outline Software testing planning, monitoring and documenting process.
5. Construct test cases for any given problem using different testing techniques

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3								1		1		1
CO2	2	3								1		1		1
CO3	2	3								1		1	2	3
CO4	2	3								1		1	2	3
CO5		2	3							1		1	2	2

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOKS:

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008. (Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 10, 12, 13)
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009. (Listed topics only from Chapters 3, 4, 16, 17, 20,21, 22,24)
3. Aditya P Mathur: Foundations of Software Testing, Pearson Education, 2008. (Listed topics only from Section 1.2 , 1.3, 1.4 ,1.5, 1.8,1.12,6. 2.1,6. 2.4)

REFERENCE BOOKS:

1. Software testing Principles and Practices – Gopalaswamy Ramesh, Srinivasan Desikan, 2nd Edition, Pearson, 2007.
2. Software Testing – Ron Patton, 2nd edition, Pearson Education, 2004.
3. The Craft of Software Testing – Brian Marrick, Pearson Education, 1995.
4. Anirban Basu, Software Quality Assurance, Testing and Metrics, PHI, 2015.
5. Naresh Chauhan, Software Testing, Oxford University press.

E-RESOURCES:

1. Selenium.org -http://docs.seleniumhq.org/docs/

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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NETWORKS AND SECURITY STREAM

COMPUTING IN COMMUNICATION NETWORKS			
Course Code	21ISE131	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Understand the need of computing in future communication networks
2. Learn the concepts like Network slicing, Mobile edge cloud and content distribution
3. Learn enabling technologies like software defined networking and network function virtualization.
4. Learn the importance of time sensitive networking
5. Explore various networking tools

UNIT – I

On the need of computing in future communication networks
Evolution of communication networks: The telephone networks: circuit-switched, The Internet: packet-switched, The cellular communication networks
The 5G communication system: The 5G Atom core: use cases, First tier: the technical requirements, Second tier: the concepts, Third tier: the softwarization technologies, Fourth tier: innovation and novelties
Softwarization: the game changer for network operators [Chapter 1]

14 Hours

UNIT – II

Network slicing: Introduction, Network slice: concept and life cycle, Network slicing architectures: Single owner, single controller, Single owner, multiple tenants – SDN proxy, Multiple owners, tenants, Network slicing in 5G.
Mobile edge cloud : Introduction, Concepts, Three Layer Architecture.
Content distribution: Content delivery networks, content distribution, Request routing
Software-defined networks: Introduction, SDN Architecture, SDN use cases
Network function virtualization: Logic structure of NFV, two-layer SDN-NFV architecture

13 Hours

UNIT – III

Integrating time-sensitive networking : Introduction to TSN, Time synchronization (IEEE 802.1AS), Packet shapers : Credit based shaper (IEEE 802.1Qav), Time aware shaper (IEEE 802.1Qbv)
Networking tools : Connectivity testing – ping, Basic network administration iproute2 (ip addr, ip link, ip route), Traffic generation – iPerf, Process monitoring – htop, Network traffic manipulation – TC, Traffic monitoring – tcpdump/Wireshark

13 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Understand the need of computing in future communication Networks
2. Learn the concepts like Network slicing, Mobile edge cloud and content distribution
3. Learn enabling technologies like software defined networking and network function virtualization.
4. Learn the importance of time sensitive networking
5. Learn various networking tools

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3						2	2	1	1
CO2	3	3	2	2					2	2	1	1
CO3	3	3	3	2	2		1	2	3	3	1	2
CO4	3	3	3	2	2	2	2		3	4	1	1
CO5	2	2	2	2							1	1

TEXTBOOKS:

1. Computing in communication Networks: From Theory to Practice by Frank Fitzek, Fabrizio
2. Granelli, Patrick Seeling, published in 2020 by academic press ISBN 13: 9780128204887

REFERENCE BOOKS:

1. Software-defined networking and security: from theory to practice
2. CRC Press/Taylor & Francis Group , Ankur, Huang, Dijiang, Pisharody, Sandeep

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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NETWORK ENGINEERING			
Course Code	21ISE132	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Introduce the detailed aspects of TCP/IP stack optimizations.
2. Explore different approaches to minimize end to end latency.
3. Explain the importance of traffic control layer and queue disciplines.
4. Introduce different types of congestion signalling mechanisms.
5. Introduce the fundamentals of Data Center Networks and its performance issues.

UNIT – I

TCP/IP stack optimizations:

Optimizations proposed for improving the performance of TCP/IP: Building blocks of TCP and TCP Fast Open, Primer on Latency and Bandwidth: Busting the Myth, History of TCP/IP and Importance of Internet Standardization, Building Blocks of TCP and Slow Start Restart (SSR), TCP Window Scaling, Impact of TCP 3-way handshake and Slow Start on HTTP Traffic, TCP's AIMD Algorithm, Packet Loss Detection Techniques in TCP, TCP Tahoe and TCP Reno, Selective Acknowledgements (SACK) for TCP. [Chapter 5 to 8 from [Grigorik 2013]

14 Hours

UNIT – II

Loss Recovery Techniques in TCP: Rate Halving and PRR (Proportional Rate Reduction)

Introduction to Queue Management Algorithms: Random Early Detection (RED), Gentle RED, Nonlinear RED and Self Configuring RED, Adaptive RED

Congestion Signalling Mechanisms: Explicit Congestion Notification (ECN), ECN+, ECN+/Wait, ECN+/TryOnce and ABE. [Chapter 5 to 8 from [Grigorik 2013]]

13 Hours

UNIT – III

Active Queue Management: Controlled Delay (CoDel) Queue Discipline, Proportional Integral (PI) Controller and PI Controller Enhanced (PIE) queue disciplines.

Introduction to Data Center Networks, Data Center TCP (DCTCP): Differences between the Internet architecture and DCN architecture, Performance problems in DCNs and existing solutions such as Data Center TCP (DCTCP).

13 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Understand different approaches for TCP/IP optimizations.
2. Ability to appreciate the importance of reducing latency for real time applications.
3. Understand the working of Linux queue disciplines, and use them to reduce latency
4. Learn the different types of congestion signalling mechanisms
5. Design and optimize networking protocols for Data Center Networks.

Mapping of COs with POs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3						2	2	1	1
CO2	3	3	2	2					2	2	1	1
CO3	3	3	3	2	2		1	2	3	3	1	2
CO4	3	3	3	2	2	2	2		3	4	1	1
CO5	3	3	2	2							1	1

TEXTBOOK:

1. [Grigorik 2013] Grigorik, Ilya. High Performance Browser Networking: What every web developer should know about networking and web performance. " O'Reilly Media, Inc.", 2013.

REFERENCE BOOKS:

1. [Kurose and Ross 2012] Kurose, James F. Computer networking: A top-down approach featuring the internet, 6/E. Pearson Education India, 2005.
2. [Khan and Zomaya 2015] Khan, S. U., & Zomaya, A. Y. (Eds.). (2015). Handbook on Data Centers. Springer, 2015.
3. [Peterson and Davis 2007] Peterson, L. L., & Davie, B. S. Computer networks: A Systems Approach. Elsevier, 2007.
4. [Online Resources] Interactive animations, Video notes from Kurose and Ross 2012, Wireshark assignments, Presentation slides, interactive exercises from the following link: http://wps.pearsoned.com/ecs_kurose_compnetw_6/216/55463/14198700.cw/

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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ADHOC NETWORKS			
Course Code	21ISE133	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Understand the MAC layer functionalities of wireless networks.
2. Understand the working of major MAC layer protocols for Adhoc wireless networks
3. Classify and distinguish Network layer protocols for Adhoc wireless networks.
4. Identify the issues with TCP/IP Transport layer protocols with wireless networks. Study few solutions provided by Adhoc transport layer protocols.
5. Identify security and QoS issues and challenges with Adhoc wireless networks.

UNIT – I

AD HOC NETWORKS

Introduction, Issues in Ad Hoc wireless networks, Ad hoc wireless internet**(T1:5.1-5.3)**.

MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS

Introduction, Issues in designing a MAC Protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks**(T1:6.1-6.3).**

CLASSIFICATION OF MAC PROTOCOLS. CONTENTION BASED PROTOCOLS

MACAW, Floor Acquisition Multiple Access Protocol, Busy Tone Multiple Access Protocols, MACA -By invitation, Media Access with Reduced Handshake. **(T1:6.5.1-6.5.5)** Contention based protocols with reservation mechanisms: Distributed Packet Reservation Multiple Access Protocol, Hop Reservation Multiple Access Protocol Five-Phase Reservation Protocol. **(T1:6.6.1,6.6.3,6.6.5)** Contention-based MAC protocols with scheduling mechanism: Distributed Priority Scheduling and Medium Access in Ad Hoc Networks. **(T1:6.7.1)**

14 Hours

UNIT – II

ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS

Introduction, Issues in designing a routing Protocol for Ad hoc wireless Networks, Classification of routing Protocols. **(T1:7.1-7.3)**

TABLE DRIVEN ROUTING PROTOCOL

Destination Sequenced Distance-Vector Routing Protocol, Wireless Routing Protocol, Cluster-Head Gateway Switch Routing Protocol. **(T1:7.4.1-7.4.3)**

On-demand routing protocol

Dynamic Source Routing Protocol, Ad Hoc On-Demand Distance-Vector Routing Protocol, Location- Aided Routing, Flow-Oriented Routing Protocol. **(T1:7.5.1,7.5.2,7.5.4,7.5.7)**

HYBRID ROUTING PROTOCOL

Core Extraction Distributed Ad Hoc Routing Protocol, Zone Routing Protocol. **(T1:7.6.1-7.6.2)** Hierarchical routing protocols: Fisheye State Routing Protocol. Metrics used by power aware routing protocols. (T1: 7.8.2-7.9.1)

TRANSPORT LAYER PROTOCOLS FOR AD HOC WIRELESS NETWORKS

Introduction, Issues in designing a transport layer Protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks. **(T1:9.1-9.3)**

15 Hours

UNIT – III

TRANSPORT LAYER PROTOCOLS FOR AD HOC WIRELESS NETWORKS (contd..)

Classification of transport layer solutions, TCP over Ad hoc wireless Networks: TCP-F, TCP-BuS, ATCP, Split TCP. **(T1:9.4,9.5:9.5.1-9.5.7)** Other transport layer protocols for Ad hoc wireless Networks: Application Controlled Transport Protocol, Ad Hoc Transport Protocol. **(T1:9.6.1-9.6.2)** Security in Ad Hoc wireless networks, Network Security requirements, Issues & Challenges in security provisioning, Network security attacks, Key Management, Secure routing in Ad hoc wireless Networks: Security Aware Ad Hoc Routing Protocol, Security Efficient ad Hoc Distance vector Routing Protocol, Security-Aware AODV. **(T1:9.7-9.11,9.12: 9.12.2,9.12.3,9.12.5)**

QUALITY OF SERVICE IN AD HOC WIRELESS NETWORKS

Introduction, Issues & challenges in providing QoS in Ad hoc wireless Networks, Classification of QoS solutions, MAC layer solutions, network layer solutions. **(T1:10.1-10.5)**

10 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Explain the issues in designing a MAC Protocol for Adhoc wireless Networks
2. Classify Adhoc MAC protocols based on contention and scheduling mechanism
3. Compare the types of Adhoc routing protocols and identify the optimal routing protocol
4. Illustrate the design issues of transport layer protocol in wireless networks
5. Identify the various transport layer Protocols and Explain the requirements, QOS and solution for security

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3								1		1		2
CO2	2	3								1		1		2
CO3	2	3								1		1		2
CO4	2	3								1		1		2
CO5	2	3								1		1		2

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOK:

1. Ad Hoc Wireless Networks: Architectures and Protocols, 2nd edition, C. Siva Ram Murthy and B S Manoj, Pearson Education, 2005.

REFERENCE BOOKS:

1. Ad Hoc Networks: Technologies and Protocols, Prasant Mohapatra and Srikanth Krishnamurthy, Springer Science, 2005.
2. Ad Hoc Mobile Wireless Networks: Principles, Protocols, and Applications, Subir Kumar Sarkar, T G Basavaraju and C Puttamadappa, Auerbach Publications, 2007.
3. Guide to Wireless Ad Hoc Networks, Sudip Misra, Isaac Woungang, Subhas Chandra Misra, Springer-Verlag, 2009.
4. The Handbook of Ad Hoc Wireless Networks, Editor Mohammad Ilyas, CRC Press, 2003.
5. Ad hoc Mobile Wireless Networks: Protocols & Systems, C. K. Toh, Prentice-Hall PTR, 2002.
6. https://onlinecourses.nptel.ac.in/noc17_cs07/preview

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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SOFTWARE DEFINED NETWORKS			
Course Code	21ISE134	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

At the end of the course, student will be able to

1. Differentiate between traditional networks and software defined networks
2. Understand advanced and emerging networking technologies and Obtain skills to do advanced networking research and programming
3. Learn how to use software programs to perform varying and complex networking tasks

UNIT - I

INTRODUCING SDN

SDN Origins and Evolution – Introduction – Why SDN? - Centralized and Distributed Control and Data Planes-The Genesis of SDN [T1: 2,3]

SDN ABSTRACTIONS

How SDN Works-The Openflow Protocol-SDN Controllers: Introduction [T1: 4,5]

15 Hours

UNIT - II

SDN ABSTRACTIONS Contd...

General Concepts – VMware-Nicira – VMware/Nicira – OpenFlow-Related – Mininet – NOX/POX – Trema – Ryu – Big Switch Networks/Floodlight – Layer 3 Centric – Plexxi – Cisco OneP [T1:5]

PROGRAMMING SDN'S:

Network Programmability-Network Function Virtualization – NetApp Development, Network Slicing[T2:3]

14 Hours

UNIT - III

SDN APPLICATIONS AND USE CASES

SDN in the Data Center – SDN in Other Environments – SDN Applications – SDN Use Cases – The Open Network Operating System [T1:7]

SDN'S FUTURE AND PERSPECTIVES

SDN Open Source – SDN Futures – Final Thoughts and Conclusions [T1:8]

10 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Explain the concept of software defined networks
2. Analyse the operation of software defined network
3. Identify the concept of software defined networks to develop network programming
4. Apply the uses of software defined networks in different networking technologies
5. Determine the future of software defined network

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2												1
CO2	2	2	3											2
CO3	2	2	3											2
CO4	1	3												
CO5	1	2												

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

REFERENCE BOOKS:

1. Software Defined Networks: A Comprehensive Approach by Paul Goransson and Chuck Black, Morgan Kaufmann Publications, 2014
2. SDN - Software Defined Networks by Thomas D. Nadeau & Ken Gray, O'Reilly, 2013
3. Software Defined Networking with OpenFlow, Siamak Azodolmolky, Packt Publishing, 2013

E-Books / Online Resources:

1. https://www.tutorialspoint.com/sdn/index.htm
2. https://www.opennetworking.org
3. http://www.nec-labs.com/~lume/sdn-reading-list.html

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – I**

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DATA SCIENCE AND MACHINE INTELLIGENCE STREAM

FUNDAMENTALS OF IMAGE PROCESSING			
Course Code	21ISE141	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives

This Course will enable students to

1. Outline the theory behind the basics of digital image processing, the relation between the components of image processing system.
2. Make use of Electromagnetic Spectrum, find the equivalence between pixels.
3. Make use of Homomorphic Filtering and how to simplify Detection of Discontinuities.
4. Get the idea of Models Elements of Information, find the equivalence between Dilation and Erosion, Opening and Closing, and identify the Hit-or-Miss Transformation.
5. Tell how Components of an Image Processing System works, their design, and get the feeling of Histogram Processing.

UNIT - I

INTRODUCTION

What Is Digital Image Processing? Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. (1.1 - 1.4)

Digital Image Fundamentals - Elements of Visual Perception, Brightness Adaptation and Discrimination (2.1), Light and the Electromagnetic Spectrum (2.2), Image Sensing and Acquisition, Image Sampling and Quantization (2.3-2.4)), Some Basic Relationships between Pixels. (2.5))

Image Enhancement in the Spatial Domain - Background, Some Basic Gray Level Transformations, Histogram Processing. (3.1-3.3)

7 Hours

Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters. (3.4-3.7)

Image Enhancement in the Frequency Domain- Background, Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters. (4.1-4.3)

8 Hours

UNIT – II

Sharpening Frequency Domain Filters, Homomorphic Filtering. (4.4-4.5)
Image Segmentation- Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds, the Use of Motion in Segmentation. (10.1-10.6)

7 Hours

IMAGE COMPRESSION

Fundamentals Image Compression, Models Elements of Information, Theory Error-Free Compression, Lossy Compression (8.1-8.5), Image Compression Standards. (8.6 only JPEG)

8 Hours

UNIT - III

MORPHOLOGICAL IMAGE PROCESSING

Preliminaries, Dilation and Erosion, Opening and Closing, the Hit-or-Miss Transformation Some Basic, Morphological Algorithms. (9.1-9.5)

COLOR IMAGE PROCESSING

Color Fundamentals, Color Models, Pseudo color Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Noise in Color Images, Color Image Compression. (6.1-6.9) Introduction to wavelet-based processing. (7.1)

9 Hours

Course Outcomes

At the end of the course the student will be able to:

1. Apply Image Sampling and Quantization techniques
2. illustrate an equivalence between Light and the Electromagnetic Spectrum, and prove Some Basic Relationships between Pixels.
3. Design and apply Smoothing Spatial Filters, Sharpening Spatial Filters
4. Explain Image Compression Standard
5. Summarize the concept of Morphological and color Image Processing.

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2							2	1		1	2	1
CO2	2	2							2	1		1	2	1
CO3	2	2							2	1		1	3	2
CO4	2	2							2	1		1	2	1
CO5	2	2							2	1		1	2	1

(L/1= Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOK:

1. Rafel C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, 2nd Edition, 2003.

REFERENCE BOOKS:

1. Anil K Jain, "Fundamentals of Digital Image Processing", Prentice-Hall of India Pvt. Ltd., 1997.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Thomson Learning, Brooks/Cole, 2nd Ed. 2001.
3. B. Chanda, D Dutta Majumder, "Digital Image Processing and Analysis", Prentice-Hall, India, 2002.
4. The Scientist and Engineers Guide to Digital Signal Processing – by Steven W. Mith, 2nd Edition, 1999, California Technical Publishing.

E-RESOURCES

1. https://www.coursera.org/learn/digital
2. http://nptel.ac.in/courses/106105032/
3. http://nptel.ac.in/courses/106105032/

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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NATURAL LANGUAGE PROCESSING			
Course Code	21ISE142	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This course will enable students:

1. To introduce the fundamental concepts and techniques of Natural language Processing for analyzing words based on Morphology and CORPUS.
2. To examine the NLP models and interpret algorithms for classification of NLP sentences by using both the traditional, symbolic and the more recent statistical approach.
3. To get acquainted with the algorithmic description of the main language levels that includes morphology, syntax, semantics, and pragmatics for information retrieval and machine translation applications.

UNIT – I

Introduction to NLP: Introduction to various levels of natural language processing, Ambiguities and computational challenges in processing various natural languages. Introduction to Real life applications of NLP such as spell and grammar checkers, information extraction, question answering, and machine translation. **Text Processing:** Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis.

14 Hours

UNIT – II

Morphology: Inflectional and Derivation Morphology, Morphological Analysis and Generation using finite state transducers.
Lexical Syntax: Introduction to word types, POS Tagging, Maximum Entropy Models for POS tagging, Multiword Expressions.
Language Modeling: The role of language models, Simple N-gram models. Estimating parameters and smoothing, evaluating language models.

14 Hours

UNIT – III

Syntax and Semantics: Introduction to phrases, clauses and sentence structure, Shallow Parsing and Chunking, Shallow Parsing with Conditional Random Fields (CRF), Lexical Semantics, Word Sense Disambiguation, WordNet, Thematic Roles, Semantic Role Labelling with CRFs.
Applications of NLP: NL Interfaces, Text Summarization, Sentiment Analysis, Machine Translation, Question answering, Recent Trends in NLP. **11 Hours**

Course Outcomes:
Students will be able to:

1. Understanding the principles and process the Human Languages Such as English and other Indian Languages using computers.
2. Creating the few texts corpus and use linguistic method to solve the problem.
3. Demonstrate understanding of state-of-the-art algorithms and techniques for text-based processing of natural language with respect to morphology.
4. Select a suitable language modelling technique based on the structure of the language.
5. Check the syntactic and semantic correctness of sentences using grammars and labelling and developing computational methods for real world applications and explore deep learning NLP.

Mapping of POs & COs:-

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	3	2										1	1
CO3	3	3	2	2									2	1
CO4	3	3	2	2									2	2
CO5	3	3	2	3									2	2

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOK:

1. Daniel Jurafsky and James H. Martin "Speech and Language Processing", 3rd edition, Prentice Hall, 2009.

REFERENCE BOOKS:

1. Chris Manning and Hinrich Schütze, "Foundations of Statistical Natural Language Processing", 2nd edition, MIT Press Cambridge, MA, 2003.
2. Nitin Indurkhya, Fred J. Damerau "Handbook of Natural Language Processing", Second Edition, CRC Press, 2010.
3. James Allen "Natural Language Understanding", Pearson Publication 8th Edition, 2012.

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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FRONT-END JAVASCRIPT ANGULAR FRAMEWORK			
Course Code	21IS143	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. To learn the basics of client-side JavaScript framework and the Angular framework
2. To learn implementing a functional front-end web application using Angular
3. To able to use various Angular features including directives, components and services
4. To able to use Angular Material and Angular Flex-Layout for designing responsive Angular applications
5. To able to use Observables and RxJS in the context of Angular applications

UNIT – I

Front-End JavaScript Frameworks: AngularJS Overview, Full-Stack Web Development: The Big Picture, Introduction to AngularJS, Models, Views and Controllers, Angular Filters, Task Runners, Angular Scope, Forms and Form Validation, Web Tools: Grunt and Gulp, Angular Scope, Angular Forms and Form Validation.

18 Hours

UNIT – II

Single Page Applications: Angular Factory, Service and Dependency Injection, Angular Templates, Angular ngRoute and Single Page Applications, Angular UI-Router for Single Page Applications.

8 Hours

UNIT – III

Client-Server Communication and Angular Testing: Client-Server Communication, Angular http Service, RESTful Services and Angular resource, Angular Testing, Web Tools: Yo and Yeoman.

13 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Outline introduction to front-end JavaScript frameworks, AngularJS and understand their components
2. Interpret Angular router and its use in designing front end web application
3. Apply from various angular features in designing angular JS web applications
4. Extend reactive programming, Rex-layout and its use in AngularJS
5. Explaining about Observables and RxJS in Angular applications.

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2		2											
CO2	1		2											
CO3	1		2											
CO4	2		2											
CO5	1		2											

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOKS:

1. Beginning AngularJS by Andrew Grant, Apress
2. AngularJS, JavaScript, and jQuery, Brad Dayley and Brendan Dayley, Sams Teach Yourself

E-RESOURCE:

1. https://books.goalkicker.com/AngularJSBook/

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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COMPUTER VISION			
Course Code	21ISE144	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

1) Understand the goal and scope of computer vision
2) Learn the basics of image and image formation in computers.
3) Learn about camera projections and viewing in computer vision
4) Learn the basics image segmentation and feature tracking.
5) Understand and learn the principles of object detection and recognition in computer vision.

UNIT – I

Introduction: Introduction to Computer Vision: Goal, areas, Human Vision, Segmentation, Perception, Semantic information, Special effects, Modeling, Applications; Linear Algebra: Vectors & matrices, Transformation matrices, Matrix inverse, Matrix rank, SVD.
Pixels, Features, and Cameras: Pixels and Filters: Images as functions, Linear Systems (filters), Convolution & Correlation. Edge detection: Simple, Canny, RANSAC; Feature detector: Local invariant, Harris, DOG, SIFT; Camera Model

14 Hours

UNIT – II

Camera: Pinhole Cameras, Cameras & lenses, Projection matrix, Intrinsic parameters, Extrinsic parameters; Stereo Vision: Epipolar geometry, Parallel images, Images rectification, Solving correspondence problem, Active Stereo Vision System.
Regions of Images, and Segmentation: Basic Concepts of Segmentation: Gestalt theory; Agglomerative, K-means & Mean-shift Clustering; Optical flow, Feature tracking, Applications;

15 Hours

UNIT – III

Advanced Image Parsing Topic and Applications: Binary, Image Matting; Figure-ground Segmentation Using Clustering Algorithms.
Recognizing Faces and Objects: Basic Concepts in Recognition & its pipeline, Nearest Neighbor Match; PCA and Eigenfaces; Tracking Millions of People: Detection, Tracklet Generation & Association.

10 Hours

Course Outcomes:
At the end of the course the student will be able to
1. Outline basics of image processing
2. Explain edge detection and feature description techniques.
3. Summarize camera projections
4. Apply image segmentation and feature tracking.
5. Apply the techniques of recognizing faces and objects to appropriate problems

Mapping of POs and COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3							1	1		1	1	1
CO2	1	3							1	1		1	1	1
CO3	2	2							1	1		1	1	2
CO4	2	2							1	1		1	2	2
CO5	1	3							1	1		1	3	2

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOKS:
1. Computer Vision: Algorithms and Applications, Richard Szeliski, Microsoft Research, Electronic draft (2010).
2. Computer Vision: A Modern Approach, David A. *Forsyth*& Jean *Ponce*, Prentice Hall; 2 edition (2011).
3. Multiple View Geometry in Computer Vision, Hartley & Zisserman, Cambridge University Press; 2 edition (2004).

REFERENCE BOOKS:

1. Machine vision, Jain, Ramesh and Rangachar Kasturi and Brian G. Schunck; McGraw-Hill, Edition-1995.
2. Introductory computer vision and image processing, Low, Adrian; McGraw-Hill, Edition-1991.
3. Digital image processing, Gonzalez, Rafael C. and Richard E. Woods; Addison- Wesley, Edition: 3rd, Year:1998.

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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GENERAL STREAM

PARALLEL COMPUTER ARCHITECTURE & PROGRAMMING			
Course Code	21ISE151	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Outline the principles of multi-core design.
2. Illustrate the concept of parallelization and develop threaded parallel programs.
3. Develop parallel programs on shared memory and distributed memory parallel computers.
4. Debug and optimize the parallel programs.
5. Develop parallel programs on Graphics Processing Units.

UNIT – I

Introduction to multi-core architecture:

Introduction, Moore's law, Amdhal's law, Gustafson's law, Motivation for Multi-core processors, Types and levels of parallelism, Flynn's classification of multi-processors, Introduction to parallelization and vectorization: Data dependencies, SIMD technology, Hardware Multithreading vs. Software multithreading, Hyper threading, SMT, Case Study of multi-core processors: Intel, AMD multi core processors. (Chapter-1 and chapter-2 of Textbook-1)

Thread programming: Definition of thread and process, Parallel programming models, Parallel Programming constructs: Synchronization, Deadlock, Critical sections, Threading APIs-POSIX threads. (Chapter-4 Textbook-1)

15 Hours

UNIT – II

Shared and distributed memory parallel programming:

MPI Model: Collective communication, Data decomposition, Communicators and topologies, point-to-point communication, MPI Library, OpenMP: Directives and clauses, environment variables, Programs using OpenMP and MPI. Introduction to intel TBB, Thread-Safeness.

(Chapter-4 Textbook-1)

Multithreaded program debugging:

Benchmarks and other performance analysis tools, vTune Performance Analyzer, Thread Checker, Thread Profiler, hotspots, performance issues in algorithms, branch misprediction, cache organization, cache loads, efficiency, hardware and software prefetch.

(Chapter-2,3, and 4 of Textbook-2)

15 Hours

UNIT – III

Introduction to GPUs and CUDA programming:

Introduction to GPU Computing, Evolution of Graphics Processing Units, CUDA Device Architecture - Architecture of Modern GPUs, Generalized structure of CUDA Enabled GPU Device, CUDA Enabled NVIDIA GeForce 8800 GPUs. CUDA Thread Model, CUDA Thread Scheduling, Compute Capability, SIMD and SIMT, CUDA Memory Model, Introduction to CUDA C Programming -Structure of a Typical CUDA C Program -Data Transfer Between the Host and Device, CUDA programs with 1D Grid of 1D Blocks, 2D Grid of 2D Blocks, Tile-based Algorithms using Shared Memory- Matrix multiplication.

(Chapter-7 Textbook-1)

9 Hours

Course Outcomes:

At the end of the course the student will be able to:

1. Identify the concept of multi-core architecture and motivation behind it
2. Design a parallel program using the multithreading concept
3. Develop parallel programs using parallel programming frameworks
4. Describe the concept of multithreaded program debugging
5. Develop GPU programs using CUDA

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3		3	2				1			3	
CO2	3	3			2	2		1		2	3	3
CO3	3	3	3		2	2		1		2	3	3
CO4	3	3			2			1		2	3	3
CO5	3	3	3		2	2		1		2	3	3

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXT BOOK

1. Introduction to Parallel Computing, by Niranjan N Chiplunkar, Raju K., Wiley, 2020.
2. The software optimization cookbook- High performance Recipes for IA-32 Platforms – Richard Gerber, Aart J.C.Bik, Kevin B.Smith, Xinmin Tian, Intel press

REFERENCE BOOK

1. Multicore programming- Increasing performance through software multithreading, -- Shameem Akhter and Jason Roberts, Intel press
2. Advanced Compiler Design Implementation- Steven S. Muchnick, Morgan Kaufman Publishing 2000
3. www tutorials on introduction to parallel computing.

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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COMPUTER GRAPHICS			
Course Code	21ISE152	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Illustrate interactive computer graphics using OpenGL.
2. Illustrate geometric transformations on objects.
3. Infer the representation of viewing, Color and Illumination models in graphic

UNIT – I

INTRODUCTION [1st Textbook]

Chapter 1 : 1.1 - Applications of computer graphics; **1.2 -** A graphics system; **1.3 -** Images: Physical and synthetic; **1.4 -** Imaging Systems; **1.6 -** The synthetic camera model; **1.6 -** The programmer's interface; **1.7 -** Graphics architectures; **1.8 -** Programmable Pipelines; **1.9 -**Performance Characteristics **Chapter 2:** Graphics Programming: **2.1 -** The Sierpinski gasket; **2.2 -** Programming Two Dimensional Applications, **6.1 -** Basic Implementation Strategies; **6.2 -** Four major tasks, **2.10.3 -** Hidden Surface Removal; **6.12 -** Antialiasing.

Chapter 2: The OpenGL: 2.3 - The OpenGL API; **2.4 -** Primitives and attributes; **2.5 -** Color; **2.6 -** Viewing; **2.7 -** Control functions; **2.8 -** The Gasket program; **2.9-** Polygons and recursion; **2.10 -** The three-dimensional gasket; Plotting Implicit Functions.

14 Hours

UNIT – II

INPUT AND INTERACTION

Interaction; Input devices; Clients and Servers; Display Lists; Display Lists and Modeling; Programming Event Driven Input; Menus; Picking; A simple CAD program; Building Interactive Models; Animating Interactive Programs; Design of Interactive Programs; Logic Operations.

[Textbook 1] Chapter 3: Geometric Objects and Transformations - I: **3.1 -** Scalars, Points, and Vectors; **3.2 -** Three - dimensional Primitives; **3.3 -** Coordinate Systems and Frames; **3.6 -** Modeling a Colored Cube; **3.7 -** Affine Transformations; Rotation, Translation and Scaling; **3.9 -** Transformation in Homogeneous Coordinates; **3.10 -** Concatenation of Transformations.

15 Hours

UNIT – III

VIEWING [Textbook 1]

Chapter 4: 4.1 - Classical and computer viewing; **4.2 -** Viewing with a Computer; **4.3 -** Positioning of the camera; **4.5.1-** Simple projections; Projections in OpenGL; **4.9 -** Interactive Mesh Displays; **4.4 -** Parallel - projection matrices; **4.7 -** Perspective - projection matrices; **4.10 -**Projections and Shadows.

Chapter 5: LIGHTING AND SHADING [Textbook 1]

5.1 - Light and Matter; **5.2** - Light Sources; **5.3** - The Phong Lighting model; **5.4** - Computation of vectors; **5.5** - Polygonal Shading; **5.6** - Approximation of a sphere by recursive subdivisions; **5.7: 5.7.1** - Light sources in OpenGL; **5.7.2** - Specification of materials in OpenGL; **5.9** - Shading of the sphere model; **5.11** - Global Illumination.

IMPLEMENTATION [Textbook 1]

Chapter 6: 6.3 - Clipping: **6.4** - Line - segment clipping, **6.8** - Rasterization: **6.9** - Bresenham's Algorithm, **6.10** - Polygon Rasterization.

10 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Explain the concepts of the graphics system and its implementation strategies.
2. Use OpenGL to create interactive computer graphics.
3. Apply basic transformations on objects using OpenGL
4. Demonstrate the viewing and projection matrices.
5. Apply light materials to illuminate model for rendering 3D objects

Mapping Levels of COs to POs / PSOs														
COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2													
CO2	2													
CO3	2	2											2	
CO4	2	2											2	
CO5	1	2											2	

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOK:

1. Edward Angel: Interactive Computer Graphics A Top Down Approach with OpenGL, 5th Edition, Pearson Education, 2008.

REFERENCE BOOKS:

1. Donald Hearn and Pauline Baker: Computer Graphics OpenGL Version, 3rd Edition, Pearson Education, 2004.
2. F.S. Hill Jr.: Computer Graphics Using OpenGL, 3rd Edition, PHI, 2009.
3. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics, Pearson Education 1997.

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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OPERATIONS RESEARCH			
Course Code	21ISE153	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

1. To know the basics of OR, modelling and applications of OR.
2. Definition of linear programming model, formulation of linear programming model and application of linear programming model using different techniques.
3. To formulate the problem and solve the problem by using different techniques.
4. Describe mathematical formulation of an Assignment Problem and solve various scenarios by using different methods.
5. Understand and identify the project management techniques.

UNIT – I

INTRODUCTION: Introduction to OR, nature and meaning, applications, modelling in OR, phases of OR study. Linear Programming: Introduction to Linear Programming through an example, graphical method, formulation of LP model from practical problems, assumptions and properties of linear programming, simplex method.
T1: Chap 2, Chap 3, Chap 5
T2: Chap 1, Chap 3

7 Hours

Revised simplex method, Big M method, 2 phase method, Duality theory, Primal and dual relationship, Dual simplex method.
T1: Chap 5, Chap 6, Chap 7, Chap 8, Chap 9

8 Hours

UNIT – II

TRANSPORTATION PROBLEMS: Special types of main programming, transportation problems, methods to find initial feasible solution and modification to obtain optimal solution (Degeneracy in transportation problems, unbalanced transportation problems. 8 Hours
Assignment problem Mathematical formulation of an assignment problem, unbalanced assignment problem, TSP, Hungarian method.
T2: Chap 5
T1: Chap 15, Chap 16

8 Hours

UNIT- III

CPM, PERT: Representation of a project by a network, activities and events, starting times, finishing times, floats, slacks, CPM, Idea of crashing probabilistic times and PERT analysis.
T1: Chap 31

8 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Explain the importance of OR and its applications.
2. Apply the simplex method to solve linear programming problem graphically.
3. Illustrate how to minimize the total transportation cost, and to optimize the distribution of available resources.
4. Apply the concepts of assignment problem to solve the given problem in various scenarios.
5. Develop the abilities in evaluating project management techniques like PERT, CPM and to handle complex tasks of time estimation & project scheduling.

Mapping Levels of COs to POs / PSOs														
COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2													
CO2	2	2												
CO3	2	2												
CO4	2	2												
CO5	2	2											2	

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOKS:

1. Operations Research, S D Sharma, 15th edition.
2. Operations Research – An introduction, Hamdy A Taha, PHI, 7th Edition.

REFERENCE BOOKS:

1. Operation research, Kanti Swaroop, Man Mohan and Gupta.
2. Introduction to operation research, a computer oriented algorithmic approach, Gillett B G, McGraw Hill, 1976.

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT			
Course Code	21ISE154	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

1. Learn the basic concepts of Robotic Process Automation
2. Understand processes which can be automated, associated business documentation basics, RPA journey of an organization
3. Develop familiarity and deep understanding of UiPath tools and prepare students to be Junior RPA Developer

FIRST WEEK – RPA Basics

History of Automation, Story of Work, Introduction to RPA, RPA vs. Automation, RPA and AI, RPA and emerging ecosystem, Industries best suited for RPA, Process that can be Automated

SECOND WEEK – Introduction to UiPath

UiPath and its products, Robots and their types, Studio Overview, Orchestrator, UiPath Studio Installation, The User Interface, Features of Studio – Managing Activities Packages, Managing Extensions, Reusing Automation Library, Version Control, Introduction to Automation Debugging, Activities Guide

Lab Experiments: Install UiPath Studio Extension in Browsers – Chrome Browser, Firefox Browser; Install Activity Packages in UiPath Studio – Excel Activity Package Installation, Email Activity Package Installation, PDF Activity Package Installation; Version Control using TFS; Build a workflow that prints "Hello World" in a message box.

THIRD WEEK – Variables and Arguments

Variables and its types, Variables Panel, Scope of Variable, Arguments, Arguments Panel, Argument Directions, Argument vs Variable

Lab Experiment: Build a workflow that swaps the values of two variables using a third variable

FOURTH WEEK – UI Automation & Selectors

UI interactions, Input actions and Input Methods – Input actions: Click, Type Into, Send Hotkey; Input Methods – Default, SendWindowMessages, Simulate Type/Click, Containers, Recording & its types, Selectors, Types of Selectors – Full and Partial, Containers and Partial Selectors, Dynamic Selectors, Wildcards in Selectors, UI Explorer, Anchors, Debugging selectors

Lab Experiments: Build a workflow that uses different input methods to input data in a Notepad; Build a workflow that opens a browser and then opens UiPath's website; Build a workflow using Web Recorder in UiPath Studio to Sign in to UiPath's website; Build a workflow that fills the form on RPAChallenge.com website with organized data from an excel file; Build a workflow that replaces double spaces with single spaces from a text stored in multiple Notepad files with different names.

FIFTH WEEK – Control Flow

Sequences, Control Flow and its types, Decision control – IF, Switch, IF vs Switch, Loops – Do While, While, For Each, Other control flow activities – Delay, Break, Assign, Continue, Parallel, Flowcharts – Introduction, Decisions in flowcharts, Loops in flowcharts, nesting flowcharts and sequences, Sequences vs. Flowcharts, Error handling – Errors, Exceptions, Error handling approach, Try Catch, Retry Scope, Global Exception Handler, Continue On Error, Best Practice for Error Handling

Lab Experiments: Build a workflow using if statement which tells a user whether he will get the second Marshmallow or not; Build a workflow using Switch activity that asks users' their eye colour and display their personality in a message box; Build a workflow for a 'Guessing Game'; Build a workflow using While loop that tells the user if the input is a prime number or not; Build a workflow to display file names from a folder in the Output panel and also store names in an MS World file; Build a workflow using Parallel activity; Build a workflow that asks user for his name and two-digit lottery number and displays if he is a winner; Build a workflow using Try Catch activity.

SIXTH WEEK – Data Manipulation

Data Manipulation and its importance – Introduction & operations, Data conversion, String Manipulations – Introduction & methods, RegEx, DataTable Manipulations, Collection, its types and manipulations – Lists, Dictionaries

Lab Experiments: Build a workflow using ToString method that converts an integer to string; Build a workflow using Format, Join, IndexOf, Split, and Substring methods that extracts key information from a text and prints in a different format; Build a workflow using Split and Contains methods that extract sentences containing "RPA" from a UiPath webpage

SEVENTH WEEK

Lab Experiments -Build a workflow using data table activities to join two library databases using matching student ID and display output in a message box; Build a workflow using Concat and Join method that merges two lists containing the UK and Spain city names, sorts it, capitalizes the first letter of each item, and displays it in a message box.

EIGHT WEEK – Automation Concepts and Techniques

Extraction and its techniques – Screen scraping, Data scraping, PDF Extraction, Automation Techniques – Workbook and Excel automation (read/write), Email automation

Lab Experiments: Build a workflow using Screen Scrapper Wizard that scrapes text using Tesseract OCR scraping method from an image and stores in a Notepad

NINTH WEEK

Lab Experiments: Build a workflow using Screen Scrapper Wizard that scrapes text using Full-Text scraping method and stores in a Notepad file; Build a workflow using Data Scraping Wizard that scrapes blog post titles from UiPath Blog from multiple pages;

TENTH WEEK

Lab Experiments: Build a workflow using Read PDF Text activity and extract only Email IDs and Phone Numbers from a PDF file and store in an MS Word file; Build a workflow using Read Range and Append Range activity to read data from a workbook and append data to another workbook;

ELEVENTH WEEK

Lab Experiments: Build a workflow that calculates total monthly deposit of a bank from an Excel file and store output in a new sheet; Build a workflow that extracts attachments from the emails containing the word "Resume" in its subject.

TWELETH WEEK – Orchestrator

Orchestrator overview, Publishing a Robot to Orchestrator, Orchestrator Functionalities, Orchestrator User Interface – Categories of functionalities – Automations – Processes, Triggers, Queues, Transactions, Assets, Management – Folders, Users, Roles, Robots, Environments, Machines, Packages, Libraries, Monitoring – Robots, Jobs, Queues, Logs

Lab Experiments: Create an Asset of Credential type in Orchestrator and display the credential asset username in Studio;

THIRTEENTH WEEK

Lab Experiments - Create a Queue in Orchestrator and add excel data values in the queue.

Course Outcome:

1. To prepare students to be Junior RPA Developers
2. Learn the basic concepts of Robotic Process Automation
3. Develop familiarity and deep understanding of UiPath tools
4. Develop the ability to independently design and create robots for business processes
5. Develop skills required to pass UiPath RPA Associate v1.0 Exam

Mapping Levels of COs to POs / PSOs														
COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	2												
CO2	1	2												
CO3	1	2												2
CO4	1	2											2	
CO5	1	2												2

(L/1 = Low 30%-49%, M/2 = Medium 50%-69%, H/3 = High >70%)

TEXTBOOK:

1. Alok Mani Tripathi: Learning Robotic Process Automation, 1st Edition, Packt Publishing Ltd., 2018.

REFERENCE BOOKS:

1. Power Point Presentations from UiPath.
2. Lab Guide from UiPath

WEB References:

1. https://academy.uipath.com/
2. https://www.uipath.com/rpa/academic-alliance

SEE Question Paper Pattern:

There will be **8** questions of **20** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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OPEN ELECTIVE (VI Semester) - 2023-2024

Sl. No.	Code	Name
1.	21MA8X02	Linear Algebra (for all except CS, IS, EC, CCE & AIML)
2.	21HU8X03	Intellectual property rights (for all)
3.	21CV8X07	Environment Impact Assessment (for all except Civil)
4.	21ME8X08	Industrial Pollution Control (for all except Mechanical)
5.	21HU8X24	Professional and Cognitive Communique (for all)
6.	21ME8X28	Operations Management and Entrepreneurship (for all except Mechanical)
7.	21IS8X38	Introduction to Python Programming (for all except CS & IS)
8.	21BT8X40	Bio Fuel Engineering (for all except BT)
9.	21BT8X42	Solid Waste Management (for all except BT & Civil)
10.	21EC8X59	PCB Design (For all except E&C)
11.	21ME8X63	Innovation & Entrepreneurship (for all)
12.	21HU8X68	Introduction to Yoga (The classes will be conducted from 7.00 a.m. to 8.00 a.m. Those who are willing to come at 7.00 a.m. should only register)
13.	21HU8X70	Overview of Indian Culture and Arts (for all)
14.	21HU8X71	Principles to Physical Education (The classes will be conducted from 5.30 p.m. to 6.30 p.m. Those who are willing to come at 5.30 p.m. should only register)
15.	21HU8X72	Introduction to Japanese language (Students with no backlogs, CGPA should be above 7.0 & who opt to get placed in Japanese companies in Japan/India are eligible to register)
16.	21HU8X74	Introduction to German Language (for all)
17.	21ME8X75	Sustainable Development Goals (for all)
18.	21IS8X76	Web Technologies (for all except CS & IS)
19.	21CS8X77	Programming in Java (for all except EC,CS & IS)
21.	21CS8X78	Data Structures & Algorithms (for all except EC,CS & IS)
21.	21EE8X79	Electric Vehicle Technology (for all except EE)
22.	21HU8X81	National Cadet Corps: Organization, Functions & Capabilities (for only NCC Cadet Students)
23.	21EC8X82	Fundamentals of Image Processing – a practical approach (Only for CV, ME & BT)
24.	21HU8X86	Introduction to Yakshagana (for all - who are familiar with kannada Language)
25.	21ME8X88	Marketing Management (for all except Mechanical)

LINEAR ALGEBRA			
Course Code	**21MA8X02**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning Objectives:

This course will enable the students to

1. Understand the concepts of vectors, bases.
2. Determine the kernel, range, rank, and nullity of a linear transformation and apply them suitably in their field of study.
3. Find the canonical forms and appraise its importance in various fields.
4. Make use of Gram-Schmidt process to produce an orthonormal basis.
5. Learn the concepts of singular value decomposition and PCA.

UNIT - I

Vector spaces

Vector spaces, subspaces, bases and dimensions, coordinate vecotrs, null spaces and column spaces of the matrices.

Linear Transformations

15 Hours

UNIT - II

Canonical Forms

Review of characteristic values, similarity of matrices, Cayley Hamilton theorem, annihilating polynomials, invariant subspaces, Jordan and rational canonical forms.

Inner Product Spaces

Inner products; inner product spaces, orthogonal sets and projections, Gram-Schmidt process, QR-factorization, Least-squares problems.

15 Hours

UNIT - III

Symmetric Matrices and Quadratic Forms:

Diagonalization, quadratic forms, constrained optimization, singular value decomposition and principal component analysis. Applications to linear recurrence relations.

09 Hours

Course Outcomes: At the end of the course student will be able to

1.	Interpret vectors in two and three-dimensional spaces both algebraically and geometrically.
2.	Analyze the concept of a linear transformation as a mapping from one vector space to another and be able to calculate its matrix representation with respect to standard and nonstandard bases.
3.	Understand the concepts of Jordan and rational canonical forms.
4.	Make use of Gram-Schmidt process to produce an orthonormal basis and also able to use least square approximation method to obtain the solution of ill conditioned system.
5.	**Apply techniques of constrained optimization singular value decomposition and PCA for problems arising in various engineering fields.**

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→ / **↓ Course Outcomes**	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2										
CO2	2	2										
CO3	3	1										
CO4	3	2										
CO5	3	2										

1: Low 2: Medium 3: High

Mode of Teaching and Learning:
Class room teaching. Use of mathematical softwares (such as MATLAB, MATHEMATICA, SAGE, ETC.) as teaching aid.

Assessment Details (both CIE and SEE)	
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student must obtain minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration). Based on this grading will be awarded.	
Continuous Internal Evaluation:	
1.	Methods recommended: Two Tests (80%), Written Quiz (10%) and module assignments (10%).
2.	The class teacher must decide the topic for closed book test and Written Quiz. In the beginning only teacher must announce the methods of CIE for the subject.
Semester End Examination:	
	There will be **8** questions of **21** marks each in the question paper categorized into **3 Units** as per the syllabi & contact hours. The student will have to answer **5** full questions, selecting **2** full questions each from **Unit - I** & **Unit – II** and **1** full question from **Unit – III**.

TEXTBOOKS:	
1.	**Kenneth Hoffman and Ray Kunze, "Linear Algebra," 2nd edition, Pearson Education (Asia) Pte. Ltd, 2104.**
2.	David C.Lay, “Linear Algebra and its Applications”,3rd edition, Pearson Education (Asia) Pte. Ltd, 2105.
REFERENCE BOOKS:	
1.	M. Artin , Algebra Prentice Hall of India.2104.
2.	Gilbert Strang, “Linear Algebra and its Applications”, 4th edition, Thomson Learning Asia, 2103.
3.	Bernard Kolman and David R. Hill, “Introductory Linear Algebra with Applications”, Pearson Education (Asia) Pte.Ltd 7th edition ,2103.
4.	Sheldon Axler, “Linear Algebra Done Right”, Springer International Publication, Third Edition,2115.

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INTELLECTUAL PROPERTY RIGHTS

Course Code	**21HU8X03**	**Course Type**	**OEC**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**Credits**	**03**
Total Teaching Hours	**39+0+0**	**CIE + SEE Marks**	**50+50**

Teaching Department: Humanities

Course Learning Objectives:	
1.	Understand the creativity component in intellectual property, different types of legal protection of intellectual properties and other basic concepts of Intellectual property.
2.	Analyze different types of protection for inventions, different types of agreements and treaties for Intellectual properties with an ability to examine patent types, specifications and patent search and database for 'prior art'.
3.	Understand the basic procedure of drafting claims, apply for patents, other legal forms of intellectual property rights and also to examine the protocol involved in protection of inventions like patents.

UNIT - I	
Introduction to Intellectual Property Invention and Creativity - Intellectual Property (IP) – Importance, Jurisprudential definition and concept of property, rights, duties and their correlation; History and evaluation of IPR – like Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications.	8
Agreements and Treaties History - General Agreement on Trade and Tariff (GATT). Indian Position vis-a-vis WTO and Strategies; TRIPS Agreement; Madrid Agreement; Hague Agreement; WIPO Treaties; International convention relating to Intellectual Property - Establishment of WIPO - Mission and Activities – Budapest Treaty; PCT; Indian Patent Act 1970 & recent amendments – Patent (Amendment) Rules, 2117	8
UNIT - II	
Basics of Patents and Concept of Prior Art Introduction to Patents; Types of patent applications: Ordinary, PCT, Conventional, Divisional and Patent of Addition; Specifications: Provisional and complete; Forms and fees Invention in the context of "prior art"; Patent databases; Searching International Databases; Country-wise patent searches (USPTO, EPO, WIPO, IPO, etc.)	8
Patent filing procedures National & PCT filing procedure; Time frame and cost; Status of the patent applications filed; Structure of Patent document, Precautions while patenting – disclosure/non-disclosure; Financial assistance for patenting - introduction to existing schemes; Patent licensing and agreement; Patent infringement- meaning, scope, litigation, case studies	8
UNIT - III	
Case Studies: Patents: Biological Cases - i) Basmati rice ii) Turmeric iii) Neem; Non-biological cases – (i) TVS V/S Hero, (ii) Samsung V/S Nokia – Copyright and related rights – Trade Marks – Trade secrets - Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition; Technology transfer and license agreements (US anti-HIV drug license to Africa)	7

Course Outcomes: At the end of the course student will be able to

1.	Have a General understanding of the Intellectual Property Rights.
2.	Have awareness of different forms of intellectual property rights, national and international IPR related legislations.
3.	Have a general understanding about the provisions, privileges and limitations of intellectual property right holders with an understanding of the legal aspects (civil or criminal) of the use of intellectual property rights.
4.	Acquire Knowledge of National and International Trade Agreements and Agencies functioning in relation to intellectual property rights
5.	Be aware and have a general understanding of patenting procedures and licensing.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	**PSO↓**	
↓ Course Outcomes													1	2
CO1		3	3	2		3			2	2		3		
CO2	2	2	3			3		3	1	1	2	2		
CO3	2			2		3			2	2	2	3		
CO4			1	1		3			1	2		3		
CO5	3	2	1			3			3	1		2		

1: Low 2: Medium 3: High

REFERENCE MATERIALS:

1.	BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., 2107
2.	Kankanala C., Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd., 2107
3.	Subbaram N.R. "Handbook of Indian Patent Law and Practice", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.
4.	Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.
5.	Intellectual Property Today: Volume 8, No. 5, May 2101,
6.	WTO and International Trade by M B Rao. Vikas Publishing House Pvt. Ltd.
7.	Correa, Carlos M. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and

	policy options, Zed Books, New York 2100
8.	Wadehra, B. L. Law relating to patents, trademarks, copyright designs & geographical indications 2 ed. Universal Law Publishing 2100
9.	Sinha, Prabhas Chandra Encyclopedia of Intellectual Property Rights, 3 Vols. Eastern Book Corporation, 2106.
10.	"Practical Approach to Intellectual Property Rights"; Rachna Singh Puri and Arvind Vishwanathan, I. K. International Publishing House Pvt. Ltd.
E-RESOURCES:	
1.	http://www.w3.org/IPR/
2.	http://www.wipo.int/portal/index.html.en
3.	http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html
4.	www.patentoffice.nic.in
5.	www.iprlawindia.org/

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ENVIRONMENTAL IMPACT ASSESSMENT			
Course Code	**21CV8X07**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning Objectives:

This Course will enable students to

1. Identify the need to assess and evaluate the impact of projects on environment.
2. Explain major principles of environmental impact assessment.
3. Understand the different steps within environmental impact assessment.
4. Appreciate the importance of EIA for sustainable development and a healthy environment.

UNIT – I

Evolution of EIA: Concepts of EIA, EIA methodologies (Adhoc, Network Analysis, Checklists, Map overlays, Matrix method), Screening and scoping, Rapid EIA and Comprehensive EIA, General Framework for Environmental Impact Assessment, EIA Specialized areas like environmental health impact assessment, Environmental risk analysis.

16 Hours

UNIT - II

Baseline data study, Prediction, and assessment of impacts on physical, biological, and socio-economic environment, Legislative and environmental clearance procedures in India, Public participation, Resettlement, and rehabilitation.

10 Hours

UNIT – III

Fault free analysis, Consequence Analysis, Introduction to Environmental Management Systems, Environmental management plan-Post project monitoring Environmental Audit: Cost Benefit Analysis, Life cycle Assessment. Case studies on project, regional and sectoral EIA.

13 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Understand phenomena of impacts and know the impact quantification of various projects in the environment.
2. Liaise with and list the importance of stakeholders in the EIA process.
3. Know the role of public in EIA studies.
4. Overview and assess risks posing threats to the environment.
5. Assess different case studies/examples of EIA in practice.

Course Articulation Matrix :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1				2	3	2					2	3	
CO2	1	1				2	3	2					2	3	
CO3	1	1				2	3	2					2	3	
CO4	1	1				2	3	2		3			2	3	
CO5	1	1		3		2	3	2				3	2	3	

Note:- 1:Low 2:Medium 3: High

TEXTBOOKS:

1. Noble, L. 2110. Introduction to environmental impact assessment. A Guide to Principles and Practice. 2nd edition. Oxford University Press, Don Mills, Ontario.
2. Larry W. Canter, Environmental Impact Assessment, McGraw Hill Inc. Singapore, 1996

ADDITIONAL REFERENCE MATERIALS

1. Morris and Therivel, 2109. Methods of Environmental Impact Assessment, 3rd edition. New York, NY: Routledge.
2. Hanna, K.S. 2109. Environmental impact assessment. Practice and Participation. 2nd edition. Oxford, University Press, Don Mills, Ontario.

NPTEL SOURCES

http://nptel.ac.in/courses/121108004/
http://nptel.ac.in/courses/121108004/module3/lecture3.pdf

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INDUSTRIAL POLLUTION CONTROL			
Course Code	**21ME8X08**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning Objectives: This Course will enable students to,	
1	Know the Consequences of pollution, relationship between man and environment over the last few decades, necessity of modern awareness on pollution and how carbon audit can help in developing a carbon strategy.
2	Identify the Importance of Meteorology in pollution control and global warming, various types of plume dispersions and its effect; analyze various levels of plume height for different pollutants.
3	Distinguish Particulates and fly ash separation techniques such as cyclone separator, electrostatic precipitator efficiency calculations etc.
4	Illustrate Formation, measurement and control techniques for Smoke and gaseous pollutants.
5	Summarize the Effects of water, soil, plastics and odor pollution their control techniques, Different Pollution Control Acts, Legal aspects of pollution control and how these acts can help in bringing down the pollution rate.

UNIT - I

Introduction to Pollution

Man and the environment, types of pollution and its consequences, Changing environmental management concept, sustainable industrial growth, carbon audit, Ill effects of various pollutants, permissible concentration levels & AQI.

Meteorology

Meteorology, Wind rose, Lapse rate, plume dispersion studies & Numerical problems

15 Hours

UNIT - II
Separation techniques Different types of Particulates, Need for Separation techniques, Sources of Particulates Matter Fly Ash Electrostatic precipitator (Problems) Theory of settling processes (Design Problems), Bag House fabric filter Cyclone separator Spray Tower Scrubbers & Venturi Scrubber **Smoke and gaseous pollutants** Smoke- White, blue and black smoke, Sources of smoke, T,T,T-O Principle of smoke Measurement of stack smoke intensity using Ringlemann Chart and Smokescope & Bosch Smoke meter, Domestic and Industrial Incinerators-Design factors, Pollutant gaseous So2, Co, UBHC, Nox their ill effects and & control methods.. **15 Hours**
UNIT - III
Water, soil, noise, and odor pollution, their control methods, problems associated with nuclear reactors, Legal aspects of pollution control in India, brief details of Euro and BS standards. **9 Hours**

Course Outcomes:

At the end of the course the student will be able to

CO 1	Identify the various types of pollutants and distinguish between them with regards to Particulate matters and AQI.
CO 2	Outline the instruments for Meteorological measurements, distinguish types of plume dispersions and its effect; analyze the concentration of various gaseous pollutants from T-Z diagrams.
CO 3	Explain the Particulates and fly ash separation techniques, compare and Interpret their efficiency.
CO 4	Illustrate Formation, measurement and control techniques for Smoke and gaseous pollutants
CO 5	Identify Effects of water, soil, plastics and odor pollution on environmental Pollution and explain the Legal aspects of pollution control.

TEXTBOOKS:

1. "Environmental Pollution Control Engineering, *Wiley Eastern Ltd.*,
2. "Introduction to Environmental Engineering & Science", Gilbert M Masters, PHI,1995
3. "Environmental Pollution Control Engineering, *C. S RAO New Age Int.*

REFERENCE BOOKS:

1. *"Air Pollution"*, Henry C. Perkins, Mc-Graw Hill, 1974.
2. *"Air Pollution control"*, W. L. Faith, *John Wiley*

MOOC/NPTEL Resources:

1. http://nptel.ac.in/courses/105106119/36

Course Articulation Matrix

Course Code / Name : 21ME8X08/ Industrial Pollution Control														
Course Outcomes (CO)	**Program Outcomes (PO)**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C-21ME8X08.1	2								1	1		1		
C-21ME8X08.2	2								1	1		1		
C-21ME8X08.3	2								1	1		1		
C-21ME8X08.4	2								1	1		1		
C-21ME8X08.5	2								1	1		1		

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I** & **Unit – II** and **1** full question from **Unit – III**.

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PROFESSIONAL & COGNITIVE COMMUNIQUÉ

Course Code	**21HU8X24**	**Course Type**	**OEC**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**Credits**	**03**
Total Teaching Hours	**39+0+0**	**CIE + SEE Marks**	**50+50**

Teaching Department: Humanities

Course Learning Objectives:

1.	To Problematize Commonsense & Apply Critical thinking skills
2.	Comprehend etiquettes and manners in different situations
3.	Be gender sensitive in both offline and online behavior
4.	Exhibit better comprehension of the social implications of human body
5.	Understand the importance of reading and writing skills

UNIT - I	
Common sense and Emotional Intelligence Common sense, Commonsensical Consensus, Critical thinking, Unsettling commonsensical Consensus, Role of language in Common sense and Critical Thinking; Nature & Functions of Emotional Intelligence, Emotions, Intelligence and Creativity, Growth of Emotional Intelligence	15
Etiquettes & Workplace Etiquette, Workplace Etiquettes, Workplace Readiness Skills, Significance of Cross-Cultural Understanding; Cultural Sensitivity, Impact of social media in Workplace	
UNIT - II	
Social Networking Sites and its Impacts Emergence of social media, Impact on Gender and Self Representation, Regulatory and Liberatory aspects of social media, Offline Norms & Online Behaviour	15
Gender and Body Gender & Sex, Genderization, Homogeneity and Heterosexuality, Gender Expressions, Gender Schooling, Representations of Body, Objectification, Gender Perspectives of Body, Different Ways of Seeing the Body, Discipline & Coercion, ISA & RSA	
UNIT - III	
Writing Types of Writing, Note Taking Methods, Plagiarism **Reading** Styles of Reading, Types of Reading,Scanning, Skimming	9

Course Outcomes: At the end of the course student will be able to	
1.	Problematize Commonsense & Apply Critical thinking skills
2.	Comprehend etiquettes and manners in different situations
3.	Be gender sensitive in both offline and online behavior
4.	Exhibit better comprehension of the social implications of human body
5.	Understand the importance of reading and writing skills

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	**PSO↓**	
↓ Course Outcomes													1	2
CO1		3							3	3		3		
CO2		2						3	2	3		2		
CO3		3							2	2		3		
CO4		3							2	2		3		
CO5		2							3	3		2		

1: Low 2: Medium 3: High

REFERENCE MATERIALS:

1.	Geetha.V. Gender. Kolkatta: Web Impressions, 2109.
2.	Bailey, Jane, et al. "Negotiating with Gender Stereotypes On Social Networking Sites: From "Bicycle Face" to Facebook." Journal of Communication Enquiry 37.2 (2113): 91-112.
3.	Barry, Peter. Beginning Theory. New Delhi: Viva Books, 2110.
4.	Berger, John. Ways of Seeing. London: Penguin Books, 1977.
5.	Cranny-Francis, Anny, et al. Gender Studies: Terms and Debates. New York: Palgrave Macmillan, 2103.
6.	Gauntlett, David. Media, Gender and Identity: An Introduction. London: Routledge, 2108
7.	Pilcher, Jane, and Imelda Whelehan. 50 Key Concepts in Gender Studies. London: Sage, 2104. Print.
8.	Jeanne, Haraway Donna. Simians, Cyborgs, and Women. London: Free Association Books, 1991. Web.
9.	Koskela, Hille. "Webcams, TV Shows and Mobile Phones: Empowering Exhibitionism." Surveillance & Society 2.3 (2104): 199-215.Web.

E-RESOURCES:

1.	http://www.cyberpsychology.eu/view.php?cisloclanku=2109061501/ >.
2.	http://www.surveillance-and-society.org/articles2(2)/webcams.pdf
3.	http://eprints.rclis.org/19790/>.

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OPERATIONS MANAGEMENT & ENTREPRENEURSHIP

Course code	**21ME8X28**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(3:0:0)**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning Objectives: This Course will enable students to,

1	Define production/operations management, Classify Production and service system and different type of production systems, Understand the importance of CRM and ERP
2	Appreciate the importance of Quality tools and methods in operations management
3	Analyze the data draw variable process control charts and determine process capability; Understand salient issues concerning reliability
4	Understand the issues related to entrepreneurship, characteristics of an entrepreneur and different studies carried out during project appraisal.
5	Identify and differentiate the different national and state level funding agencies.

UNIT – I

Introduction to Production/ Operations Management: Concept of production, Classification of production systems, Production Management, Concept of operations, Distinction between Manufacturing Operations and Service Operations, Objectives of Operations Management (Customer Service and Resource utilization/ Competitive advantage through Quality-Delivery-Cost), Scope of Operations Management. Introduction to

Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP).

7 Hours

Introduction to Quality Concepts: The Meaning of Quality and Quality Improvement, Key dimensions of Quality, Concept of cost of quality. Customers' perception of quality.

TOTAL Quality Management: Definition, Principles of TQM, Gurus of TQM, Benefits of TQM.

Managing Quality: Quality circles, Continuous Improvement- Juran's Trilogy, PDSA cycle, Kaizen, 7 QC tools,

Philosophy of statistical process control and modeling process quality: Normal distribution tables, Finding the Z score, Central limit theorem, Chance and assignable causes of variation, Statistical Basis of the Control Charts (basic principles, choices of control limits, significance of control limits, warning limits)

9 Hours

UNIT – II

Control charts for variables: Control Charts for X-Bar and R- Charts, Type I and Type II errors, Simple Numerical Problems,

Process capability: The foundation of process capability, Natural Tolerance limits, c_p – process capability index, c_{pk}, p_p – process performance index, summary of process measures. Numerical problems. Concept of Six sigma.

Introduction to reliability, Mean time to failure, Mean time between failures, Bath tub curve, Reliability of series and parallel systems, Numerical problems on the above topics.

8 Hours

Entrepreneurship: Concept of Entrepreneurship, Stages in entrepreneurial process, Role of entrepreneurs in Economic Development, Barriers to Entrepreneurship, Meaning of Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneurs, Intrapreneur - an emerging Class.

Identification of business opportunities: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.

Application of Operations Management concepts in Facility/ Business Location: General procedure for making locations decisions, Numerical Problems on application of Breakeven analysis and Transportation method to make location decisions.

8 Hours

UNIT – III

Small scale industries: Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI, Steps to start and SSI, Government policy towards SSI; Different Policies of SSI, Impact of Liberalization, Privatization, Globalization on SSI. Effect of WTO/GATT on SSI, Supporting Agencies of Government for SSI, Ancillary Industry and Tiny Industry (Definition Only)

Institutional Support: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency; SISI; NSIC; SIDBI; KSFC.

7 Hours

Course Outcomes (CO)

CO 1	Differentiate production and service systems. Discuss continuous and intermittent production systems with their advantages and disadvantages. Discuss CRM and ERP systems.
CO 2	Discuss Total Quality Management tools and methods. Solve problems on fundamentals of statistics and normal distribution.
CO 3	Draw and Analyze variable process control charts and determine process capability. Calculate reliability of series and parallel systems using the information on failure rate and time.
CO 4	Discuss entrepreneurship, characteristics of an entrepreneur and barriers to entrepreneurship. Discuss the elements of a project report and feasibility studies conducted in the project appraisal.
CO 5	Identify and differentiate the national and state level funding agencies. Discuss the effect of GATT and WTO on Indian economy.

TEXTBOOKS:

1. **Production / Operations Management**, Joseph G Monks, McGraw Hill Books
2. **Production and Operations Management**, William J Stevenson, Tata McGraw Hill, 8th Edition.
3. **Statistical Quality Control**: RC Gupta, Khanna Publishers, New Delhi, 2105.
4. **Total Quality Management**: Dale H. Besterfield, Pearson Education, 2103.
5. **Dynamics of Entrepreneurial Development & Management** – Vasant Desai – Himalaya Publishing House
6. **Entrepreneurship Development** – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2106 (2 & 4).

REFERENCE BOOKS:

1. **Statistical Quality Control:** E.L. Grant and R.S. Leavenworth, 7th edition, McGraw- Hill publisher.
2. **Statistical Process Control and Quality Improvement:** Gerald M. Smith, Pearson Prentice Hall. ISBN 0 – 13-049036-9.
3. **Statistical Quality Control for Manufacturing Managers:** W S Messina, Wiley & Sons, Inc. New York, 1987
4. **Statistical Quality Control:** Montgomery, Douglas, 5th Edition, John Wiley & Sons, Inc. 2105, Hoboken, NJ (ISBN 0-471-65631-3).
5. **Principles of Quality Control:** Jerry Banks, Wiley & Sons, Inc. New York.
6. **Entrepreneurship Development** – S.S.Khanka – S.Chand & Co.

MOOC/NPTEL Resources:

1. http://nptel.ac.in/courses/110105067/
2. https://www.edx.org/course/operations-management-iimbx-om101-1x

Course Articulation Matrix

Course Code / Name: 18ME8X28/ Operations Management & Entrepreneurship															
Course Outcomes (CO)	**Program Outcomes (PO)**														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C-21ME8X28.1	3	1	0					1	1	1	1				
C-21ME8X28.2	1	2	0						1	1	3				
C-21ME8X28.3	2	2	0				1	0	1	1	3				
C-21ME8X28.4	3	1	0			1	0	1	1		2				
C-21ME8X28.5	1	1	0			1	1	1	1		3				

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I** & **Unit – II** and **1** full question from **Unit – III**.

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INTRODUCTION TO PYTHON PROGRAMMING			
Course Code	**21IS8X38**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Prerequisites:
Student must have fundamental knowledge of procedure-oriented programming.

Course Learning Objectives (CLOs):
At the end of the course student should be able to:

- Construct Python programs using data types and looping.
- Design object-oriented Python programs using classes and objects.
- Design useful stand-alone and CGI applications in Python.

UNIT - I

INTRODUCTION: Introduction to python, Installing Python; basic syntax, interactive shell, editing, saving, and running a script. The concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages. Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation.
STRING MANIPULATIONS: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa, Binary, octal, hexadecimal numbers

LISTS, TUPLES, AND DICTIONARIES: Basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

15 Hours

UNIT – II

FUNCTIONS: Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions

CLASSES AND OOP: Classes, objects, attributes and methods; defining classes; design with classes, data modelling; persistent storage of objects, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; exception handling, try block

15 Hours

UNIT – III

FILE HANDLING: Manipulating files and directories, Reading from Text Files, Writing to Text Files, Reading from Binary Files, Writing to Binary Files, Seeking Within Files, Creating and Reading a formatted file (csv or tab-separated).

GRAPHICAL USER INTERFACES: event-driven programming paradigm; creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames Simple CGI form

9 Hours

Course Outcomes:

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C8X38.1	Demonstrate the basics of Python programming like data types and looping	L2
C8X38.2	Apply the basic data structures in solving the problems	L3
C8X38.3	Experiment with usage of functions in a given problem	L3
C8X38.4	Develop Objects by creating classes and apply object-oriented features	L3
C8X38.5	Develop applications in Python using File Programming &User Interface	L3

Table: Mapping of COs to PIs, POs and BTL			
Course Outcomes (COs)	**Program Outcomes (POs) Addressed**	**Performance Indicators (PI)**	**Bloom's Taxonomy Level (BTL)**
CO1	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1	L2
CO2	1,2,3	1.4.1,1.3.1,2.3.1,3.1.1,3.2.2	L3
CO3	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1,3.1.6,3.2.1,3.2.2	L3
CO4	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1,3.1.6,3.2.1,3.2.2	L3
CO4	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1,3.1.6,3.2.1,3.2.2	L3

Mapping Course Outcomes with Programme Outcomes:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C8X38.1	1	2	1											
C8X38.2	1	2	1										2	2
C8X38.3	1	2	2										2	3
C8X38.4	1	2	2										2	3
C8X38.5	1	2	2										2	3

(L/1=Low30%-49%,M/2=Medium50%-69%,H/3=High>70%)

TEXTBOOK:

1) Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2111, Cengage Learning, ISBN: 978-1111822705

ADDITIONAL RESOURCES:
1. Think Python. PDF is free.

SEE Question Paper Pattern:

There will be **8** questions of **21** marks each in the question paper divided into**3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I &Unit – II** and **1** full question from **Unit – III.**

BIOFUEL ENGINEERING			
Course Code	**21BT8X40**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

***Prerequisites*:** Nil
***Co-requisites*:** Nil

Course Learning Objectives:
The objective of this course is
- To learn the fundamental concepts of biofuels, types of biofuels, their production technologies.
- To learn the concepts of feedstock utilization and energy conversion technologies.

UNIT – I

LIQUID BIOFUELS
Description and classification of Biofuels; Primary biomass: Plant materials-Woody biomass, Lignocellulosic and agroindustrial by-products, starchy and sugary crops. Secondary biomass: Waste residues and co-products-wood residues, animal waste, municipal solid waste. Biomass production for fuel – algal cultures, yeasts (Lipid and carbohydrate).
Production of biodiesel: Sources of Oils – edible and non edible; Esterification and Transesterification. Free fatty acids; saponification; Single step and two step biodiesel production. Catalysts for biodiesel production – homogeneous (alkali/acidic) and heterogeneous; Lipase mediated process. General procedure of biodiesel production and purification Quality Control Aspects: GC analysis of biodiesel, fuel property measurements, ASTM (D-6751) and Indian standards (IS15607).Algal Biodiesel production.
Production of Bioethanol: Bioethanol production using Sugar; Starch and Lignocellulosic feedstocks; Pretreatment of lignocellulosic feed stock

15 Hours

UNIT – II

BIOHYDROGEN AND MICROBIAL FUEL CELLS
Enzymes involved in H_2 Production; Photobiological H_2 Production: Biophotolysis and Photofermentation; H_2 Production by Fermentation: Biochemical Pathway, Batch Fermentation, Factors affecting H_2 production, Carbon sources, Detection and Quantification of H_2. Reactors for biohydrogen production.
Microbial Fuel cells: Biochemical Basis; Fuel Cell Design: Anode & Cathode Compartment, Microbial Cultures, Redox Mediators, Exchange Membrane, Power Density; MFC Performance Methods: Substrate & Biomass Measurements, Basic Power Calculations, MFC Performance: Power Density, Single vs Two-Chamber Designs, Wastewater Treatment Effectiveness; Advances in MFC.

15 Hours

UNIT – III

RECOVERY OF BIOLOGICAL CONVERSION PRODUCTS

Biogasification of municipal solid waste: Anaerobic processing; Types of digesters, Biogas plant in India.

Thermochemical processing: Planning an incineration facility, Incineration technologies: Mass burning system; Refuse derived fuel (RDF) system; modular incineration; Fluidized bed incineration; energy recovery; Fuel production through biomass incineration, Pyrolysis and gasification, hydrothermal processing.

9 Hours

Course Outcomes:
At the end of this course, student should be able to:
1. Mark the significance of biofuels and raw materials and Identify suitable feedstock for production of biofuels.
2. Illustrate the production of liquid biofuels from various feed stocks.
3. Demonstrate production of biohydrogen using microbial sources.
4. Extend the concepts of microbial fuel cells towards development of specific application.
5. Understand and apply the concepts of biochemical processing to harvest energy from waste products/streams.

Mapping of POs &COs:

	PO											
CO	1	2	3	4	5	6	7	8	9	10	11	12
CO1		M							L			
CO2		M							L			
CO3		M							L			
CO4		M							L			
CO5		M							L			

REFERENCE BOOKS:

1. Drapcho, C. M., Nhuan, N. P. and Walker, T. H. *Biofuels Engineering Process Technology,* Mc Graw Hill Publishers, New York, 2108.
2. Jonathan R.M, *Biofuels – Methods and Protocols (Methods in Molecular Biology Series),* Humana Press, New York, 2109.
3. Olsson L. (Ed.), *Biofuels (Advances in Biochemical Engineering/Biotechnology Series,* Springer-Verlag Publishers, Berlin, 2107.
4. Glazer, A. and Nikaido, H. *Microbial Biotechnology – Fundamentals of Applied Microbiology*, 2 Ed., Cambridge University Press, 2107.
5. Godfrey Boyle (Ed). *Renewable Energy- Power for sustainable future*, 3rd Ed. Oxford. 2112.
6. Ramachandran, T. V. *Management of municipal solid waste*. Environmental Engineering Series. Teri Press, 2116.

SEE QUESTION PAPER PATTERN:

Unit No.	I	II	III
Questions to ask (21 marks/Qn)	3	3	2
Questions to answer	2	2	1

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SOLID WASTE MANAGEMENT			
Course Code	**21BT8X42**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

***Prerequisites*:** Nil
***Co-requisites*:** Nil

Course Learning Objectives:
The objective of this course is
1. To learn types of solid wastes, collection, treatment and disposal methods.
2. To understand various processing techniques and regulations of treatment and disposal.

UNIT – I

INTRODUCTION TO SOLID WASTES AND ITS SEGREGATION & TRANSPORTATION

Solid waste – Definition, Sources of waste, Classification of Solid waste, Characteristics of Solid Waste (Physical, Chemical, Biological), Solid waste problems – impact on environment and health. Concept of waste reduction, recycling and reuse.

Waste collection and segregation: Solid waste generation, Onsite handling and segregation of wastes at source, Collection and storage of municipal solid wastes, Equipment used and manpower required in collection, Collection systems and routes.

Transportation: Transfer stations: types, location, maintenance, Methods and means of transportation.

15 Hours

UNIT – II

PROCESSING TECHNIQUES, RECOVERY OF RESOURCES AND WASTE DISPOSAL

Processing Techniques: Unit operations for separations and processing, mechanical and thermal volume reduction, Incineration of solid wastes – process and types of incinerators (liquid injection, rotary kiln and fluid bed), Biological processing – composting, vermicomposting, biomethanation, fermentation, Drying and dewatering of wastes.

Recovery of Resources: Heat recovery in incineration process, energy recovery and conversion of products from biological processes.

Dumping of solid wastes, Landfills – Types, site selection, preliminary design, operation, case study, Advantages and disadvantages of landfills, Leachate and landfill gases: Collection and treatment, Landfill disposal for hazardous wastes, biomedical waste.

16 Hours

UNIT – III

SOLID WASTE MANAGEMENT RULES AND PLANNING ISSUES

Legislative trends and impacts: Major legislations, Government agencies. Municipal Solid Waste Management Act (1999), Hazardous Wastes (Handling and Management) Rules, Biomedical Waste (Handling and Management) Rule (1998), e-Waste (Management and Handling) Rule 2111.

Planning and developing a site for solid waste management, Site Remediation: Assessment and Inspection, Remedial techniques, Siting guidelines.

8 Hours

Course Outcomes:

At the end of this course, the student will be able to

1. Identify the sources, classification and characteristics of solid wastes
2. Develop insight into the collection, transfer, and transport of solid waste.
3. Apply waste processing techniques and recovery of resources from the waste.
4. Select the alternatives of solid waste disposals and its impacts.
5. Acquire knowledge about solid and hazardous waste management legislative rules.

Mapping of POs & COs:

	PO											
CO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	L								L			
CO2	L	L				L	L		L			
CO3		M							L			
CO4		M				L	L		L			
CO5	L								L			L

REFERENCE BOOKS:

1. Tchobanaglous, G., Theisen, H. and Vigil, S. A. *Integrated Solid Waste Management,* McGraw – Hill. 1993.
2. Tchobanoglous, G., Thiesen, H., Ellasen, *Solid Waste Engineering Principles and Management*, McGraw – Hill, 1997.
3. Landrefh, R. E. And Rebers, P. A. Lewis, *Municipal Solid Wastes-Problems & Solutions*, 1997.
4. Bhide, A. D. and Sundaresan, B. B. *Solid Waste Management in Developing Countries*, Indian National Scientific Documentation Centre. New Delhi, 2100.

SEE QUESTION PAPER PATTERN:

Unit No.	I	II	III
Questions to ask (21 marks/Qn)	3	3	2
Questions to answer	2	2	1

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PCB DESIGN			
Course Code	**21EC8X59**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Pre-requisites:

Basic electrical and electronics engineering.

Course Learning Objectives:

1. To enable students to gain knowledge of Schematic Design techniques & PCB design techniques
2. To expose students to complete PCB Design & manufacturing process

List of Experiments

- Introduction to PCB design tool: building a schematic circuit and layout
- Exploring the PCB design tool by creating new components, using existing components and footprint, simulation features, Active & Passive Components
- Drawing a PCB layout in a single layer with constraints such as board area, track width, packages, via etc
- Creating a double layer PCB for a given schematic circuit
- Creating and using different component package types
- Fabrication of single and double layer PCB on a copper clad board using hatching/engraving technique.
- Handling PCB prototype machine using Mach3 CNC tool for the PCB prototype.

Detailed Course Plan

Lab 1
Introduction to PCB design tool : building a schematic circuit.

Lab 2
Creating Library & Components, using existing components and footprint, simulation features, Active & Passive Components.

Lab 3
Designing a single layer PCB for given schematic circuit diagram, Gerber file generation.

Lab 4
Designing a double layer PCB for given schematic circuit diagram, Gerber file generation.

Lab 5
Simulating digital and analog circuits for given test cases.

Lab 6
Handling programmable microcontroller circuit in the simulation environment of schematic editor .

Lab 7
Defining a footprint for a component in the PCB layout.

Lab 8
Fabrication of single layer PCB using PCB prototype machine – Generating bit filein Copper Cam tool.

Lab 9
Fabrication of single layer PCB using PCB prototype machine – Setting up Mach3 CNC tool.

Lab 10
Fabrication of double layer PCB using PCB prototype machine – Generating bit file in Copper Cam tool.

Lab 11
Fabrication of double layer PCB using PCB prototype machine -Setting up Mach3 CNC tool.

Lab 12
Component placement and soldering.

Lab 13
Desoldering and testing.

Scheme of SEE Examination
It is a 3-Hour exam at the end of the semester where the student is to demonstrate the PCB designing process.

Sl.No	Activity	Max. Marks
1	Creating schematic for a given circuit diagram	15
2	PCB Layout design	21
3	Setting up fabrication	15
Total		**50**

Course Outcomes:
At the end of the course the student will be able to
1. Draw schematic circuit and create PCB layout for single or multilayer PCB
2. Fabricate single and double-layer PCB using Mach3Mill operated CNC machine.

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INNOVATION AND ENTREPRENEURSHIP			
Course Code	**21ME8X63**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Prerequisites:
The student must have learnt basics of Engineering concepts, applications and business as a whole.

Course Learning Objectives: This Course will enable students to,

1	Understand Technological Innovation
2	Understand Innovation management and the difference between Invention and Innovation.
3	Appreciate the importance of Innovation as management process and Innovation management techniques.
4	Define Innovation system and Understand the importance of Technology management and Transfer.
5	Identify Technological Entrepreneurship and its types and Understand the Institutional support provided for Entrepreneurs

UNIT – I

INTRODUCTION TO TECHNOLOGICAL INNOVATION	**14 Hours**
Basic Concepts and Definitions: Technology - Technology Management – Invention – Creativity – Innovation - The Concept of Technological Innovation - Innovation Posture, Propensity and Performance - Innovation Measurement - Key factors linking creativity and innovation – Classifications of Innovations – Innovation Process.	
INTRODUCTION TO INNOVATION MANAGEMENT	
Innovation Management Through Management of Knowledge and Education – Types of Learning - Difference Between Innovation and Invention - Types and Characteristics of Innovation.	
INNOVATION AND COMPETITIVENESS	
Case Study – Barriers for Innovation and Competitiveness.	

UNIT – II	
INNOVATION AS A MANAGEMENT PROCESS	**14 Hours**
Activities to enhance companies capacity for innovation – Management of Technological Innovation: Corporate Perspective, National Perspective, Theoretical Perspective and Individual Perspective - Challenges in Technological Innovation Management - Case Study in Technological Innovation Management - Innovation Management Techniques (IMTs).	
INNOVATION SYSTEMS	
The Concept of Innovation Systems - Innovation Systems: Sectoral, Regional, National.	
TECHNOLOGY MANAGEMENT AND TRANSFER	
Technology Transfer - Impacts of MNCs in technology transfer -	
UNIT – III	
INTRODUCTION TO TECHNOLOGICAL ENTREPRENEURSHIP	**11 Hours**
Types of Entrepreneurship: Mixed Entrepreneurship, Pure Entrepreneurship, Social Entrepreneurship, Collaborative Entrepreneurship, Internal Entrepreneurship, External Entrepreneurship - Sustainable Entrepreneurship -	
INSTITUTIONAL SUPPORT	
Business Incubator (Bi) - Determination of the Five Incubator Services - Incubation Centres in India – Atal Incubation Centre – Startup India - NSIC, KIADB, KSFC.	

Course Outcomes (CO):	
At the end of the course the student will be able to,	
CO 1	Describe technological innovation and its key features for business.
CO 2	Describe innovation management and difference between invention and innovation.
CO 3	Explain innovation as a management process, its management and perspectives. Understand Innovation management techniques.
CO 4	Explain innovation system, technology management and transfer.
CO 5	Explain technological entrepreneurship and institutional support.
TEXTBOOK:	
1	Carayannis, Elias G., Samara, Elpida T., Bakouros, Yannis L., "Innovation and Entrepreneurship Theory, Policy and Practice", Springer, 2115.
REFERENCE BOOKS:	
1	Dick Whittington, "Digital Innovation and Entrepreneurship", Cambridge University Press, 2118.

Course Articulation Matrix:

Course Code / Name : 21ME8X63/ INNOVATION AND ENTREPRENEURSHIP														
Course Outcomes (CO)	**Program Outcomes (PO)**												**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C-21ME8X63.1	3	2				1	1		1			1	3	1
C-21ME8X63.2	3	2				1	1		1			1	3	1
C-21ME8X63.3	2	2				1	1		1			1	3	1
C-21ME8X63.4	2	2				1	1		1			1	3	1
C-21ME8X63.5	3	2				1	1		1			1	3	1

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I** & **Unit – II** and **1** full question from **Unit – III**.

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INTRODUCTION TO YOGA

Course Code:	**21HU8X68**	**Course Type**	**OEC**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**Credits**	**03**
Total Teaching Hours	**39**	**CIE + SEE Marks**	**50+50**

Teaching Department: Mechanical Engineering

Course Learning Objectives:

1.	To give a brief history of the development of Yoga
2.	Identify names of different classical texts on Yoga
3.	To illustrate how Yoga is important for healthy living
4.	To explain the Asanas and other Yogic practices
5.	To explain, how Yoga practices can be applied for overall improvement

UNIT – I

Yoga: Meaning and initiation, definitions and basis of yoga, History and development, Astanga yoga, Streams of yoga.Yogic practices for healthy living. General guidelines for Yoga practices for the beginners: Asanas, Pranayama.	**09 Hours**
Classification of Yoga and Yogic texts:Yogasutra of Patanjali, Hatha yogic practices- Asanas, Pranayama, Dharana, Mudras and bandhas.	**07 Hours**

UNIT – II

Yoga and Health: Concept of health and Diseases-Yogic concept of body – pancakosaviveka, Concept of disease according to Yoga Vasistha.	**06 Hours**
Yogic concept of healthy living- rules & regulations, yogic diet, ahara, vihara. Yogic concept of holistic health.	**04 Hours**
Applied Yoga for elementary education:Personality development- physical level,mental level,emotional level. Specific guidelines and Yoga practices f**or** - Concentration development,Memory development	**04 Hours**

UNIT - III

Yoga and physical development: Mind-body, Meditation, Yogasanas and their types. Different Yoga practices and Benefits.	**05 Hours**
Specific guidelines and Yoga practices for – Flexibility, Stamina, Endurance (Surya Namaskara)	**04 Hours**

Course Outcomes: At the end of the course student will be able to

1.	Understand a brief history of the development of Yoga
2.	Know important practices and principles of Yoga
3.	Explain how Yoga is important for healthy living
4.	Practice meditation to improvement of concentration etc.
5.	Have knowledge about specific guidelines of yoga practices

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	**PSO↓**	
↓ Course Outcomes													1	2
CO1						1			1			1		
CO2						1			1			3		
CO3						2			1			3		
CO4						3			2			3		
CO5						2			2			3		

1: Low 2: Medium 3: High

TEXTBOOKS:	
1.	B.K.S. Iyengar, "Light on Yoga: The Classic Guide to Yoga by the World's Foremost Authority", Thorsons publisher 2116.
2.	MakarandMadhukar Gore, "Anatomy and Physiology of Yogic Practices: Understanding of the Yogic Concepts and Physiological Mechanism of the Yogic Practices", MotilalBanarsidass Publishers; 6 edition (2116).
3.	Swami SatyanandaSaraswati, "Asana, Pranayama, Mudra and Bandha: 1", Yoga Publications Trust.
REFERENCE BOOKS:	
1.	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice by Ann Swanson
2.	Yoga for Everyone : 50 Poses For Every Type of Body by Dianne Bondy
E Books / MOOCs/ NPTEL	
1.	https://onlinecourses.swayam2.ac.in/aic19_ed29/preview
2.	https://youtu.be/FMf3bPS5wDs

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OVERVIEW OF INDIAN CULTURE AND ART			
Course Code	**21HU8X70**	**Course Type**	**OEC**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**Credits**	**03**
Total Teaching Hours	**39+0+0**	**CIE + SEE Marks**	**50+50**

Teaching Department: Humanities

Course Learning Objectives:

1.	To understand the relevance of Culture in Human Life, dynamism of Indian Culture and Arts through ages.
2.	To understand the local culture and its vibrancies.
3.	To develop awareness about Indian Society, Culture and Arts under Western rule.
4.	To comprehend different dimension and aspects of the Indian culture and arts.
5.	To appreciate cultural performances in India.

UNIT - I	
Knowing Culture What is Culture, Different aspects of Culture, Cultural expression, Importance of Culture	7
Influence of Culture Relationship of Culture with: Language, Religion and History, Gender	7
UNIT - II	
Media and Culture Role of News Papers, Indian Cinema, Music, Advertisements	7
Languages, Literature and Culture Role of Sanskrit, Vedas, Upanishads, Ramayana and Mahabharata, Puranas, other Sanskrit Literature, Buddhist and Jain Literature, Dravidian Languages and Literature, North Indian Languages and Literature, Subaltern Literature	7

UNIT - III	
Arts and Culture Indian Theatre and Performing Arts, Ritual performances, and Tuluva cultural and ritual performances.	7
(Self-study Component) **Contribution of Indian History to Culture** Ancient India – Persian and Macedonian invasions and its impact on Indian Culture, Development of Culture and Arts during the Mauryan Empire (Ashoka), the Guptas, the South Indian Dynasties – the Cholas, Nalanda as a Centre of Learning. Medieval India – Life of People under Delhi Sultanate, Rise of Islam and Sufism, Political Scene of India, Bhakti Movement, Folk Arts, Rise of Modern Indian Languages. Modern India – British Ruling and its impact on Indian Culture, Social and Religious Reforms, Indian National Movement and Achievement of Independence.	4

Course Outcomes: At the end of the course student will be able to

1.	Examine how the culture has a very important role in human life and growth of human civilization and have a general awareness on historical perspective of growth of Indian Culture and Arts.
2.	Appreciate their own local culture from an academic perspective.
3.	Know about the impact of Western Rule in India and Indian Struggle for Freedom and also its impact on Indian Culture and Arts and able to appreciate and the role of language in connecting people, growth of culture and arts beyond the barriers of religion and ages.
4.	Take interest in learning these forms of arts, and also appreciate and preserve them for the future generations feeling proud of Indian Culture, Arts and Architecture.
5.	Appreciate art performances in India which will enable them to get exposed to an artistic sphere, which eventually help them to be creative and imaginative.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	**PSO↓**	
↓ Course Outcomes													1	2
CO1		1				3		3	3	1		3		
CO2				2		3		2	3	3		3		
CO3						3		1				1		
CO4						3		2	1	2		3		
CO5						3		3	3	3		2		

1: Low 2: Medium 3: High

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PRINCIPLES TO PHYSICAL EDUCATION			
Course Code	**21HU8X71**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning Objectives:

This Course will enable students to

1. Appreciate and understand the value of physical education and its relationship to a healthy active lifestyle.
2. Work to their optimal level of physical fitness.
3. Show knowledge and understanding in a variety of physical activities and evaluate their own and others' performances.

UNIT - I

History of Physical Education - Olympic games, Modern Olympic games, Olympic Ideals & Objectives, Olympic Symbols, Olympic Flag, Olympic Emblem, Olympic Motto, Olympic Flame, Asian games
International Olympic Committee (IOC), Indian Olympic Association (IOA)
Sports awards - Eligibility, Objectives & Criteria
Yoga - Meaning and Importance
World Health organization (WHO)

10 Hours

UNIT – II

Concept of Health - Meaning of Health, Health Definition, Factors Affecting Health, Qualities of Healthy Person. Health Hazards of College Students, Physical Fitness and Exercises.
Food and Nutrition -Food & Nutrition Defined, Nutrients and their Functions - i) Proteins ii) Carbohydrates iii) Fats iv) Vitamins
Balanced Diet & Malnutrition

Health Education - Meaning of Health Education, Health Education Defined, Scope of Health Education, Importance of Health Education.
Posture - Concept of Posture, Correct Postures, Common Postural Defects
First Aid - First Aid Defined, Need and importance of First Aid, The Requisites of FirstAid, Scope of FirstAid, Qualities of a First Aider, Fundamental Principles to be followed and the Duties to be performed by the First Aider, First Aid in Different Cases.
Physical Education - Concept of Physical Education, Physical Education Defined, Importance of Physical Education, Scope of Physical Education, Aims and Objectives of Physical Education.
Teaching Aid in Physical Education
Competition - Introduction, Types of competition, Knock out, League or Round Robin Tournament.

12 Hours

UNIT – III

Training in Sports – Meaning, Principles, Warming Up & Limbering Down
Importance of Anatomy and Physiology in Physical Education, Oxygen Debt and Second wind
Leadership and Supervision – Leadership, Qualities of a good leader in Physical Education, Types of Leadership in Physical Education - 1. Teacher Leadership 2. Student Leadership.
Measurement & specification of various playing fields – Cricket, Volley Ball, Basket Ball, Badminton, Ball Badminton, Foot Ball, Hand Ball & their basic playing skills.

16 Hours

Course Outcomes:
At the end of the course, the student will be able to
1. Demonstrate an understanding of the principles and concepts related to a variety of physical activities.
2. Apply health and fitness principles effectively through a variety of physical activities.
3. Support and encourage others (towards a positive working environment).
4. Show self-motivation, organization and responsible behavior.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
↓ Course Outcomes													1	2
CO1						3			2	1		1		
CO2						3			2	1		1		
CO3						3			2	1		1		
CO4						3			2	1		1		
CO5						3			2	1		1		

1: Low 2: Medium 3: High

TEXT AND REFERENCE BOOKS:

1. A. K. Uppal, “Physical Education and Health”
2. M. L. Kamlesh, “Fundamental Elements of physical Education”,
3. Swami Ramdev, “Yog its philosophy and practice”, Divya Prakashan
4. V. K. Sharma, “Health and Physical Education”

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INTRODUCTION TO JAPANESE LANGUAGE

Course Code	**21HU8X72**	**Course Type**	**OEC**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**Credits**	**03**
Total Teaching Hours	**39+0+0**	**CIE + SEE Marks**	**50+50**

Teaching Department:

Course Objectives:

1.	Have basic spoken communication skills
2.	Write Simple Sentences
3.	Listen and comprehend basic Japanese spoken Japanese
4.	Read and understand basic Japanese characters including Kanji

UNIT - I	
(Lessons 1-6) **Grammar –** Introduction, Alphabets, Accents, Noun, Pronoun, Present Tense, Past tense **Vocabulary –** Numbers, Days, week days, months, Seasons, Nature, Dialogs and Video Clips	13
UNIT - II	
(Lessons 7-13) Communication skills – Time, Addective, Seasons, Conversation, Q&A Hobby, 5-W/1-H, Entering School/Company, Body Parts, Colours, Features etc**.**	13
UNIT - III	
(Lessons 14-21) Japanese Counting System, Birth/Death, Dialogs (Going to Party, Restaurant), My day, Success/Failure, Kanji Characters, and sentence making, Video Clips	13

Course Outcomes: At the end of the course student will be able to

1.	Understand Simple words, expressions and sentences, spoken slowly and distinctly
2.	Speak slowly and distinctly to comprehend
3.	Read and Understand common words and sentences
4.	Ask Basic questions and speak in simple sentences
5.	Write Hiragana/Katakana and Kanji (121) characters.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	**PSO↓**	
↓ Course Outcomes													1	2
CO1						3			2	1		1		
CO2						3			2	1		1		
CO3						3			2	1		1		
CO4						3			2	1		1		
CO5						3			2	1		1		

1: Low 2: Medium 3: High

INTRODUCTION TO GERMAN LANGUAGE			
Course Code	**21HU8X74**	**Course Type**	**OEC**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**Credits**	**03**
Total Teaching Hours	**39+0+0**	**CIE + SEE Marks**	**50+50**

Teaching Department: Mechanical

Course Objectives:

1.	Distinguish - definite and indefinite articles, declension of singular and plural nouns by adding certain endings to them to differentiate between subjects, objects and indirect objects and construct sentences of simple day to day usage.
2.	Differentiate between nomnative and akkusative cases with transitive and intransitive verbs, and negation with Kein/e/er
3.	Differentiate use of dative object besides the subject for some specific verbs and Apply the grammar principles of use of personal pronoun as a substitute for noun as per the case, number and gender of the noun.
4.	Differentiate preposition forms when used exclusively in akkusative or Dative forms or on combination of the two cases
5.	Differentiate conjugation of verbs in present, present-perfect and past participle tenses, separable and inseparable verbs, application of conjugation of modal verbs and position of modal verb in a sentence.

UNIT - I	
Introduction: Mein Name ist (saying who you are, greeting people and saying goodbye, asking people where they come from and where they live. Language point: I and you), Lesen der politischenKarte der Welt, Nationalitaeten und Spachen, Die Uhrzeit (The time) telling time and talking about daily routine, Tage der Woche, die Monate, die vierJahreszeiten, die Jahre Mir gehtes gut: Asking people how they are, saying how you are, saying which cities and counries people come from, Language points: verb endings), Wieschreibt man das (how do you write that?) Counting from 1-100 and above, alphabet, spelling our names and words, talking about us and them. Language points: Yes-no questions Artikel (Articles): As in English, there are definite (der/die/das) and indefinite (ein/eine) articles: the ┐ der/die/das; a/an ┐ ein/eine Die vierFälle (The four cases): Nominativ, Akkusativ, Dativ, Genitiv(Not in level A-1) Deklination des bestimmtenArtikels der/die/das Deklination des unbestimmtenArtikelsein/eine (Deklination/Declension: the variation of the form of a noun, pronoun, or adjective, by which its grammatical case, number, and gender are identified) Deklination von Substantiven (Declension of nouns) (Singular and Plural) (German nouns are declined by attaching certain endings to them, according to case, number and gender. This helps to differentiate between subjects, objects and indirect objects). Nominativ und Akkusativ(nominative and accusative cases) The verb determines the case of the noun. Some verbs only go with the nominative, others only with the accusative (or the dative). Thus, German verbs are either transitive or intransitive. (Nominative and accusative cases) Intransitive Verben (intransitive verbs) Transitive Verben (transitive verbs) Negation „kein/e/er "(negation with „kein/e/er ") (Singular und Plural) The negation of the indefinite article (ein/eine/ein) is kein/keine/kein. For this, you just have to put a „k" at the beginning of the declined form of ein/eine/ein. Peter siehteinHaus. ┐ Negation ┐ Peter siehtkeinHaus. (Peter sees a house. ┐ negation ┐ Peter does not see a house.) (With examples, writing and hearing exercises, and German to English Glossary as applicable)	13
UNIT - II	
Dativ (the dative) (You are already familiar with verbs which require a direct accusative object in addition to the subject, which is in the nominative case. But there also some verbs which require a dative object besides the subject. To identify the dative object you ask "(To) whom?") Der Plural (the plural)	13

There are many different forms of the plural in the German language. Principally, the gender and the ending of the noun determine the plural form. Then, you either attach a plural ending to the noun, change a vowel, or keep the noun as it is in the singular. Das Personalpronomen (the personal pronoun) The personal pronoun is a substitute for a noun. Its forms are determined by the case, number and gender of the noun which is to be replaced. Die Formen des Personal pronomenimNominativ (The nominative forms of the personal pronoun): Präpositionen (prepositions) German prepositions are followed by an object, either in the accusative or the dative case. Some prepositions always take an accusative object, others always a dative object. But there are also prepositions which can be followed by both. In this case, the question "Where(to)?" (□ accusative) or "Where?" (□ dative) determines the case of the object. PräpositionenmitAkkusativ und Dativ (Prepositions with accusative and dative) 1. PräpositionenmitAkkusativ (prepositions with accusative) 2. PräpositionenmitDativ (prepositions with dative) 3. PräpositionenmitAkkusativoderDativ (prepositions with accusative or dative) (With examples, writing and hearing exercises, and German to English Glossary as applicable)	
UNIT - III	
Konjugation von VerbenimPräsens (Conjugation of verbs in present tense) Verbs are conjugated by attaching certain endings, depending on the person and number of the subject. Trennbare und untrennbareVerben (separable and inseparable verbs) Verbs with prefixes are dinstinguished between separable and inseparable verbs. The prefix of an inseparable verb must never be separated from the stem. Here the stress is on the stem: be-kommen. The prefix of a separable verb gets separated from the stem when the verb is conjugated. In the infinitive, the stress is on the prefix: an-kommen 1. TrennbareVerben (separable verbs) 2. UntrennbareVerben (inseparable verbs) Konjugation von VerbenimPerfekt (Conjugation of verbs in present perfect) The present perfect (Perfekt) describes something which happened in the past and is especially used in spoken German. It is formed with the present tense form of „haben" or „sein" and the past participle of the main verb. 1. Die Bildung des Partizips (the formation of the past participle) 2. Die Bildung des Perfektsmit „haben" und „sein" (the formation of the present perfect with „haben" and „sein") Modalverben (modal verbs) A modal verb is rarely used as a main verb; instead, it usually modifies the main verb. While the main verb remains in the infinitive, the modal verb is conjugated. In German, there are 7 modal verbs: können (can/be able), dürfen (may/be allowed), wollen (want), müssen (must/have to), sollen (shall), mögen (to like), möchten (wish/would like) 1. Konjugation der Modalverben (Conjugation of the modal verbs) 2. Stellung des ModalverbsimSatz (Position of the modal verb within a sentence) (With examples, writing and hearing exercises, and German to English Glossary as applicable)	13

Course Outcomes: At the end of the course student will be able to

1.	Distinguish - definite and indefinite articles, declension of singular and plural nouns by adding certain endings to them to differentiate between subjects, objects and indirect objects and construct sentences of simple day to day usage.
2.	Differentiate between nomnative and akkusative cases with transitive and intransitive verbs, and negation with Kein/e/er
3.	Differentiate use of dative object besides the subject for some specific verbs and Apply the grammar principles of use of personal pronoun as a substitute for noun as per the case, number and gender of the noun.
4.	Differentiate preposition forms when used exclusively in akkusative or Dative forms or on combination of the two cases
5.	Differentiate conjugation of verbs in present, present-perfect and past participle tenses, separable and inseparable verbs, application of conjugation of modal verbs and position of modal verb in a sentence.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	**PSO↓**	
↓ Course Outcomes													1	2
HU1502-1.1						3			2	1		1		
HU1502-1.2						3			2	1		1		
HU1502-1.3						3			2	1		1		
HU1502-1.4						3			2	1		1		
HU1502-1.5						3			2	1		1		

1: Low 2: Medium 3: High

TEXTBOOKS:

1.	Ulrich Haessermann, Georg Dietrich, Christianne C. Guenther, Diethelm Kaminski, Ulrike Woods and Hugo Zenker, Sprachkurs Deutsch Neusaffung 1, UnterrichtswerkfuerErwachsene, Verlag Moritz Diesterweg, Universitaetsdruckerei H. Stuertz AG Wuerzburg, 1989
2.	Paul Coggle and HeinerSchenke, Teach Yourself German (a complete course in understanding, speaking and writing), Teach Yourself Books, Hodden& Stoughton Educational, UK, 2101
3.	Langenscheidt German In 30 Days: Book + Cd Paperback, www.amazon.in, – 1 September 2111

REFERENCE MATERIALS:

1.	Deutsche SprachlehrefürAusländer.
2.	ThemenAktuell (Text and workbook).
3.	Deutsch alsFremdsprache 1A.
4.	Tangram Aktuell 1A/1B (Text and workbook).
5.	Wherever required the Videos/Audios are also played in the class room sessions

E-RESOURCES:

1.	https://onlinecourses.nptel.ac.in/noc21_hs30/preview NPTEL-Swayam, German-I by Prof. MilindBrahme | IIT Madras
2.	https://www.traingerman.com/en/ powered by Sprachinstitut TREFFPUNKT Online

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SUSTAINABLE DEVELOPMENT GOALS			
Course code	**21ME8X75**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning Objectives:

Sustainable Development Goals is a 2116 United Nations officially released Agendas for Sustainable approach environmental integrity, economic viability and a just society for present and future generations. It aims to provide the knowledge, skills, attitudes and values necessary to address sustainable development challenges. They address the global challenges we face, including poverty, inequality, climate change, environmental degradation, peace and justice. Learn more and take action. This SDG program is organized in such a way to be research-led, applied interdisciplinary program that considers sustainability in both developed and developing societies, and addresses critical global challenges put forth by UN.

UNIT – I

The origin, development and idea of the SDGs

History and origins of the Sustainable Development Goals. What are the SDGs? What are their aims, methodology and perspectives? How are they related to the Millennium Development Goals?

SDGs and Society: Ensuring resilience and primary needs in society

In-depth discussion and analysis of goals related to poverty, hunger, health & well-being and education

13 Hours

UNIT – II

SDGs and Society: Strengthening Institutions for Sustainability

In-depth discussion and analysis of goals related to gender equality, affordable and clean energy, sustainable cities & communities, and peace, justice & strong institutions

SDGs and the Economy: Shaping a Sustainable Economy

In-depth discussion and analysis of goals related to work & economic growth, industry, innovation & infrastructure, inequalities, responsible production & consumption

13 Hours

UNIT – III

SDGs and the Biosphere: Development within Planetary Boundaries

In-depth discussion and analysis of goals related to clean water, climate, life below water and life on land

Realizing the SDGs: Implementation through Global Partnerships

In-depth discussion and analysis of SDG 17 which aims to implement the SDGs through partnerships, finance, technology and the development of coherence between policies.

13 Hours

Course Outcomes:

At the end of the course the student will be able to

CO 1	Summarize the UN's Sustainable Development Goals and how their aims, methodology and perspectives.
CO 2	Analyze the major issues affecting sustainable development and how sustainable development can be achieved in practice.
CO 3	Identify and apply methods for assessing the achievement/possibilities of sustainable development in Nitte gram panchayath.
CO 4	Evaluate the implications of overuse of resources, population growth and economic growth and sustainability & Explore the challenges the society faces in making transition to renewable resource use
CO 5	Create skills that will enable students to understand attitudes on individuals, society and their role regarding causes and solutions in the field of sustainable development.

TEXTBOOKS:

1. Sachs, Jeffrey D. The age of sustainable development. Columbia University Press, 2115
2. Gagnon, B., Leduc, R., and Savard, L., Sustainable development in engineering: a review of principles and definition of a conceptual framework. Cahier de recherche / Working Paper 08-18, 2108.
3. Dalby, Simon, et al. Achieving the Sustainable Development Goals: Global Governance Challenges. Routledge, 2119.
4. Sustainability: A Comprehensive Foundation by Tom Thesis and JonathanTomkin, Editors.

REFERENCE BOOKS:

1. Elliott, Jennifer. An introduction to sustainable development. Routledge, 2112.
2. Day, G.S., and P.J.H. Schoemaker (2111), Innovating in uncertain markets: 10 lessons for green technologies, MIT Sloan Management Review, 52.4: 37-45.

MOOC Resources:

1. https://www.un.org/sustainabledevelopment/poverty/

Course Articulation Matrix

Course Code / Name : 21ME/ SUSTAINABLE DEVELOPMENT GOALS														
Course Outcomes (CO)	**Program Outcomes (PO)**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	**1**	**2**	**1**	**1**	**1**	**3**	**3**	**1**	**1**	**1**		**2**	**1**	**1**
2	**2**	**2**	**1**	**1**	**1**	**3**	**3**	**2**	**1**	**1**		**1**	**1**	**1**
3	**3**	**2**	**2**	**1**	**1**	**3**	**3**	**2**	**3**	**1**		**1**	**1**	**2**
4	**3**	**2**	**3**	**1**	**1**	**3**	**3**	**2**	**1**	**1**		**1**	**3**	**2**
5	**1**	**2**	**2**	**1**	**1**	**3**	**3**	**2**	**2**	**2**		**1**	**1**	**1**

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi &contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I&Unit – II** and **1** full question from **Unit – III**.

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WEB TECHNOLOGIES			
Course Code	**21IS8X76**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning Objectives (CLOs):

At the end of the course student should be able to:

- Illustrate the Semantic Structure of HTML and CSS
- Compose forms and tables using HTML and CSS
- Design Client-Side programs using JavaScript and Server-Side programs using PHP
- Illustrate the Database connectivity using PHP
- Examine JavaScript frameworks such as jQuery

UNIT - I

Introduction to HTML- Html tags and simple HTML forms, web site structure, HTML table, Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colours and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.

15 Hours

UNIT - II

Client side Scripting: Introduction to JavaScript: JavaScript language – declaring variables, scope of variables functions, event handlers (on click, on submit etc.), Document Object Model, Form validations. Introduction to PHP: Declaring variables, data types, arrays, strings, operations, expressions, control structures, functions, Reading data from web form controls like Text Boxes, radio buttons, lists etc.,

15 Hours

UNIT – III

PHP Databases: Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, File Handling in PHP, PHP Arrays and Superglobals, Arrays, $_GET and $_POST Superglobal Arrays, jQuery Introduction: What is jQuery, Adding jQuery in to your web pages, jQuery Syntax, jQuery Selectors, jQuery Events.

9 Hours

Course Outcomes:

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C8X52.1	Adapt HTML and CSS syntax and semantics to build web pages	L2
C8X52.2	Construct and visually format tables and forms using HTML and CSS	L3
C8X52.3	Experiment with the usage of Event handling and Form validation using Java script	L3
C8X52.4	Understand the principles of object oriented development using PHP and Database concepts	L2
C8X52.5	Inspect JavaScript frameworks like jQuery whichfacilitates developer to focus on core features.	L2

Table: Mapping of COs to PIs, POs and BTL

Course Outcomes (COs)	Program Outcomes (POs) Addressed	Performance Indicators (PI)	Bloom's Taxonomy Level (BTL)
CO1	1,3	1.3.1,1.4.1,3.2.1,	L2
CO2	1,2,3	1.4.1,3.2.1,3.2.2,2.1.1,2.2.4,3.1.6	L3
CO3	1,3	1.4.1,3.2.1,3.2.2,3.4.3	L3
CO4	1,2,3	1.4.1,3.2.1,3.2.2,2.1.1,2.2.4,3.1.6	L2
CO5	1,3	1.4.1,3.2.1,3.2.2	L2

Mapping Course Outcomes with Programme Outcomes:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C8X52.1	1	2		2								1	2	
C8X52.2	1			2								1	2	
C8X52.3	1	2		2	3							1	2	
C8X52.4	1	2		2	3							1	2	
C8X52.5	1			2	3							1	2	

(L/1=Low30%-49%,M/2=Medium50%-69%,H/3=High>70%)

TEXTBOOK:

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1st Edition, Pearson Education India. (ISBN:978-9332575271)

E RESOURCES:

1. nptel.ac.in/courses/106105084/11

SEE Question Paper Pattern:

There will be **8** questions of **21** marks each in the question paper divided into**3 Units** as per the syllabus& contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I &Unit – II** and **1** full question from **Unit – III.**

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PROGRAMMING IN JAVA			
Course Code	**21CS8X77**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning Objectives:

This course will enable students to:

1. Learn fundamental features of object oriented language and JAVA programming constructs.
2. Develop and run simple Java programs using OOPS concepts of java
3. Create multi-threaded programs and event driven Graphical User Interface (GUI) programming using swing package.

UNIT – I

Introduction to Java: Java's magic: The Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements.

Classes, Inheritance: Classes fundamentals; Declaring objects; Call by value and Call by Reference, array of objects, Constructors, this keyword, and usage of static keyword.
Inheritance: inheritance basics, using super, creating multi-level hierarchy, method Overriding, abstract classes, final classes.

15 Hours

UNIT – II

Exception handling, packages and interfaces: Exception handling in Java, use of try, catch blocks, multiple catch blocks, finally block, use of throw and throws clauses, creating custom exceptions. Packages, Access Protection, Importing Packages, Interfaces. IO Streams for file handling.

Multi-Threaded Programming:
What are threads? How to make the classes threadable; Extending threads; Implementing runnable interface; creating multiple threads, join and is Alive methods of Thread class, Thread Synchronization; achieving thread synchronization among multiple threads. Thread priorities, methods to get and set thread priority

15 Hours

UNIT – III

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model;

Swings:
The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField; The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable.

09 Hours

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

1. Apply the object-oriented concepts to solve real world problems using JAVA programming features
2. Illustrate the basic constructs and object orients features of the Java language
3. Design a multi-threaded program using Java with exception handling
4. Develop Java programs that includes packages and interfaces and preform file operations in Java
5. Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings

Table-2: Mapping Levels of COs to POs / PSOs															
COs	**Program Outcomes (POs)**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3			2				1	1		1	2	3	
CO2	1	2	2		1				1	1		1		3	
CO3	1	2	3		1				1	1		1		3	2
CO4	1	2	3		1				1	1		1	2	3	3
CO5	1	2	3		1				1	1		1		3	3

Graduate Attributes (GA)

This course will map the following GA as per NBA:

1. Design/Development of Solutions
2. Problem Analysis
3. Modern tool usage

TEXTBOOK:

1. Herbert Scheldt, Java the Complete Reference, 7th Edition, Tata McGraw Hill, 2107. (Chapters 2-11, 22-24, 29,30)

REFERENCE BOOKS:

1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education, 2108, ISBN:9788131721806
2. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with Java, Tata McGraw Hill education private limited.
3. Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning.
4. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.

E-Books / Online Resources:

1. Online course material by Oracle :
   http://docs.oracle.com/javase/tutorial/index.html
2. https://www.udemy.com/courses/search/?q=java&price=price-free&view=grid

MOOC:

1. Oracle: *www.oracle.com/events/global/en/java.../java-a-beginners-guide-1721064.pdf*
2. NPTEL:*www.nptelvideos.com/java/java_video_lectures_tutorials.php*

SEE SCHEME:

There will be **8** questions of **21** marks each in the question paper divided into**3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III.**

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DATA STRUCTURES AND ALGORITHMS			
Course Code	**21CS8X78**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning Objectives:

This course will enable students to:

1. **Outline** the concepts of data structures, its types, structures and pointers.
2. **Understand** linear data structures, namely, stack, queue, singly linked list and doubly linked list.
3. **Analyze** nonlineardata structures, namely, binary tree and graphs.
4. **Analyze** the non-recursive and recursive algorithms and to represent Efficiency of these algorithms in terms of the standard Asymptotic notations.
5. **Explain** the various algorithm design techniques and apply them to solve various real world problems.

UNIT – I

INTRODUCTION:

Data Structure, Classification (Primitive and non-primitive), data structure operations.

POINTERS:

Definition and Concepts, Accessing variables through pointers, Arrays and pointers. Structures, pointers to structures.

LINEAR DATA STRUCTURES – STACKS:

Introduction and Definition, Representation of stack: Array and structure representation of stacks, Operations on stacks using C functions (Push(), Pop(), IsStackFull(), IsStackEmpty()).

LINEAR DATA STRUCTURES – QUEUES:

Introduction and Definition Representation of Queue: Array and Structure representation of queue, Operations on Ordinary Queue using C functions (Insert(), Remove(), IsQueueFul(), IsQueueEmpty())

15 Hours

UNIT – II

LINEAR DATA STRUCTURES - SINGLY LINKED LISTS:

Dynamic Memory allocation functions. Definition and concepts singly linked List: Representation of link list in memory, Operations on singly Linked List using C functions (Insert node at front, Remove a node from front, display singly linked list).

LINEAR DATA STRUCTURES - DOUBLY LINKED LISTS:

Doubly Linked List: Representation. (Operations not included).

NONLINEAR DATA STRUCTURES – BINARY TREES:

Binary Trees: Properties, Linked representation of Binary Tree, Binary Tree Traversals, Introduction to Binary Search Tree.

INTRODUCTION TO ALGORITHMS:

What is an Algorithm? Fundamentals of Algorithmic Problem Solving, understanding and representing graphs using adjacency matrix and linked list.

FUNDAMENTALS OF THE ALGORITHMS EFFICIENCY:

Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms.

15 Hours

UNIT – III

DECREASE & CONQUER:

Concept of Decrease and Conquer, Graph traversal algorithms - Depth First Search, Breadth First Search.

DYNAMIC PROGRAMMING:

Concept of Dynamic Programming, Computing a Binomial Coefficient.

GREEDY METHOD:

Concept of Greedy technique, Prims algorithm.

BACKTRACKING:

Concept of Backtracking technique, N-Queens problem.

9 Hours

Course Outcomes:

1. **Acquire** the fundamental knowledge of various types of data structures and pointers using that knowledge, analyze and design the programs using pointers
2. **Apply** the fundamental programming knowledge of data structures to analyze and design linear data structures, namely, stack, queue, singly linked list and doubly linked list and use them for solving problems.
3. **Implement** and apply the concept of binary trees and graph data structures and also understand their traversals.
4. **Analyze** non-recursive or recursive algorithm and to represent in terms of standard Asymptotic notations.
5. **Apply** Divide and Conquer, Decrease and Conquer, Dynamic programming, Greedy, and Backtracking algorithm design techniques to solve real time problems.

Table-2: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2						1				1	3		
CO2	3	1	2					1				1	3		
CO3	3	2						1				1	3		
CO4	2	3												2	
CO5	2	2	3	2	3				1			1		3	

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXTBOOKS:

1. Aaron M. Tenenbaum, Yedidyah Langsam & Moshe J. Augenstein, "Data Structures using C", Pearson Education/PHI, 2106.
2. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", 2nd Edition, Pearson Education, 2107.

REFERENCE BOOKS:

1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd edition, Universities Press, 2114.
2. Seymour Lipschutz, "Data Structures, Schaum's Outlines", Revised 1st edition, McGraw Hill, 2114.
3. Thomas H. Cormen, Charles E.Leiserson, Ronal L. Rivest, Clifford Stein, "Introduction to Algorithms", 2nd Edition, PHI, 2106.

MOOCs:

1. Introduction to Data Structures by edx , URL: https://www.edx.org/course/
2. Advance Data Structures by MIT OCW , URL: https://www.mooclab.club/
3. Data Structure by Harvard Extension School, URL: http://www.extension.harvard.
4. http://nptel.ac.in/courses/106101060/

SEE SCHEME:

There will be **8** questions of **21** marks each in the question paper divided into**3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit –III**

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ELECTRIC VEHICLE TECHNOLOGY			
Course Code	**21EE8X79**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Eligible Students: For all engineering stream except E&E Engineering

Course Learning Objectives:

1. To Understand the fundamental laws and vehicle mechanics.
2. To Understand working of Electric Vehicles and recent trends.
3. Ability to analyze different power converter topology used for electric vehicle application.
4. Ability to develop the electric propulsion unit and its control for application of electric vehicles.

UNIT – I

Vehicle Mechanics: Roadway Fundamentals, Laws of Motion, Vehicle Kinetics, Dynamics of Vehicle Motion, Propulsion Power, Force-Velocity Characteristics, Maximum Gradability, Velocity and Acceleration, Constant FTR, Level Road, Velocity Profile, Distance Traversed, Tractive Power, Energy Required, Nonconstant FTR, General Acceleration, Propulsion System Design.
Electric and Hybrid Electric Vehicles: Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains. **14 Hours**

UNIT – II

Energy storage for EV and HEV: Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Super capacitors.

Electric Propulsion:
EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives. **16 Hours**

UNIT – III

Design of Electric and Hybrid Electric Vehicles: Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor, power rating of engine/generator, design of PPS Parallel Hybrid Electric Drive Train Design: Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, energy storage design.

9 Hours

Course Outcomes:

At the end of the course student will be able to

1. Explain the roadway fundamentals, laws of motion, vehicle mechanics and propulsion system design.
2. Explain the working of electric vehicles and hybrid electric vehicles in recent trends.
3. Model batteries, Fuel cells, PEMFC and super capacitors.
4. Analyze DC and AC drive topologies used for electric vehicle application.
5. Develop the electric propulsion unit and its control for application of electric vehicles.

Course Outcomes Mapping with Program Outcomes & PSO												
Program Outcomes→ ↓ **Course Outcomes**	1	2	3	4	5	6	7	8	9	10	11	12
21EE8X .1	2	3										
21EE 8X .2	1	2	3									
21EE 8X .3	1	2	3									
21EE 8X .4	1	2	3									
21EE 8X .5	1	2	2									

1: Low 2: Medium 3: High

SEE QUESTION PAPER PATTERN:

- There will be **8** questions of **21** marks each in the question paper categorized into **3 Units** as per the syllabi & contact hours. The student will have to answer **5** full questions, selecting **2** full questions each from **Unit – I** & **Unit – II** and **1** full question from **Unit – III**.

TEXTBOOKS:

1. Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Husain, CRC Press, 2103
2. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, M. Ehsani, Y. Gao, S.Gay and Ali Emadi, CRC Press, 2105

REFERENCE BOOKS:

1. Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Sheldon S. Williamson, Springer, 2113.
2. Modern Electric Vehicle Technology, C.C. Chan and K.T. Chau, OXFORD University, 2101
3. Hybrid Electric Vehicles Principles And Applications With Practical Perspectives, Chris Mi, M. Abul Masrur, David Wenzhong Gao, Wiley Publication, 2101

E-Books / MOOC:

1. Introduction to Mechanics | Coursera
2. NPTEL: Electrical Engineering - Introduction to Hybrid and Electric Vehicles
3. Electric Vehicles - Part 1 - Course (nptel.ac.in)
4. Hybrid Vehicles (edX) | MOOC List (mooc-list.com)
5. NPTEL: Electrical Engineering - Introduction to Hybrid and Electric Vehicles
6. Electric Cars: Technology | My MOOC (my-mooc.com)

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NATIONAL CADET CORPS: ORGANIZATION, FUNCTIONS AND CAPABILITIES

Course Code	**21HU8X81**	**Course Type**	**OEC**
Teaching Hours/Week (L:T:P:S)	**3:0:0:0**	**Credits**	**03**
Total Teaching Hours	**39+0+0**	**CIE + SEE Marks**	**50+50**

Teaching Department: Chemistry

Course Learning Objectives:

1.	To create evolved youth, who will be equipped to contribute in the development of the nation.
2.	To train students so as to achieve their physical and mental endurance. To acquire body language of a smart soldier and to inculcate the sense of authority by commanding the troop under him/her.
3.	To inculcate spirit of adventure, undertake adventure activities, to hone leadership qualities and risk-taking abilities.
4.	To understand and develop life skills, soft skills and to improve the emotional quotient of the student.
5.	To impart basic military training, to develop awareness about the defense forces and expose learners to military ethos / values

UNIT – I

NCC: Aims, Objectives and Organization NCC General, Aims, Objectives and Organization of NCC. Duties of NCC Cadets, NCC Camps: Types and Conduct. National Integration: Importance and Necessity, Unity in Diversity.	7
Personality Development Self-Awareness, Empathy, Critical and Creative Thinking, Decision Making and Problem Solving. Communication Skills, Coping with stress and emotions. Leadership: Traits, Indicators, motivation, moral values, Honor Code. Social Service and Community Development.	7

UNIT – II

Naval Communication and Seamanship Naval Communication: Introduction, Semaphore, Navigation: Navigation of Ships- Basic requirements, Chart work. Seamanship: Introduction to Anchor work, Rigging Capsule, Boat work- Parts of Boat, Boat pulling instructions, Whaler sailing instructions. Ship Modeling.	8
Disaster management and environmental awareness Disaster Management- Organization, Types of Disasters, Essential Services, Assistance, Civil Defence organization. Adventure Activities. Dos and Don’ts, Fire services and Firefighting, Environmental Awareness and Conservation.	8

UNIT – III

Naval Orientation Naval Orientation- Armed Forces and Navy Capsule, EEZ Maritime Security & ICG. Border & Coastal Areas: Security setup and Boarder/Coastal management in the area. Naval Orientation: Modes of Entry- IN, ICG, Merchant Navy. Border and Coastal areas: Security Challenges & role of cadets in Border management	9

Course Outcomes: At the end of the course student will be able to

1.	Display sense of patriotism, secular values and shall be transformed into motivated youth who will contribute towards nation building through national unity and social cohesion.
2.	Demonstrate the sense of discipline, improve bearing, smartness, turnout and develop the quality of immediate and implicit obedience of orders, with good reflexes.
3.	Acquaint, expose & provide knowledge about Army/Navy/ Air force and acquire information about expanse of Armed Forces, service subjects and important battles.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	**PSO↓**	
↓ Course Outcomes													1	2
HU1505-1.1						3	3	1						
HU1505-1.2						3	3							
HU1505-1.3									1					

1: Low 2: Medium 3: High

REFERENCE BOOKS:

1.	Cadets Handbook, R.K. Guptha, Ramesh Publishing House, New Delhi.

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FUNDAMENTALS OF IMAGE PROCESSING – A PRACTICAL APPROACH			
Course Code	**21EC8X82**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**2:0:1**	**SEE Marks**	**50**
Total Hours	**26:0:26**	**Credits**	**03**

Course Learning Objectives:

This course will enable the students to

1. Understand basic operations on images.
2. Understand the concepts of colour models.
3. Explain image enhancement techniques.
4. Perform morphological operations on images.
5. Perform thresholding operation for image segmentation.

Software Tool Required: MATLAB

Image Fundamentals: Description of Image and Basic operations: Image Brightening, Darkening, Addition, Subtraction, Multiplication and logic operations,Binary and Gray scale images, Color Fundamentals.

Image Enhancement Techniques: Concept & Importance of Histogram, Basic gray level transformations, Histogram processing, Basics of spatial filtering, smoothing spatial filters, sharpening filters.

Morphological Operations and Thresholding: Introduction, Erosion and Dilation, Opening and Closing, Thresholding, segmentation methods.

26 Hours

List of Experiments:

1. Introduction to MATLAB.
2. Reading and analyzing images.
3. Image Conversions.
4. Basic operations on images.
5. Basic Arithmetic operations on images- Addition, Subtraction and Multiplication.

6. Exploring Image manipulation operations.
7. Histogram processing.
8. Demonstration of Effects of Filters on images-Smoothing.
9. Demonstration of Effects of Filters on images-Sharpening.
10. Exploring different color models.
11. Demonstration of Morphological Operations.
12. Demonstration of thresholding operations.
13. Exploring image segmentation methods.

Scheme of SEE
Laboratory based evaluation

Course Outcomes:
At the end of the course the student will be able to

1. Demonstrate the understanding of basic operations on images
2. Apply image enhancement methods
3. Perform segmentation operation

Mapping of PO's/ PSO's & CO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	3	-	-	1	1	1	1	-	-	-	-
CO2	3	-	-	-	3	-	-	1	1	1	1	-	-	-	-
CO3	3	-	-	-	3	-	-	1	1	1	1	-	-	-	-

3 – High **2 – Medium** **1 - Low**

TEXTBOOKS:

1. R. C. Gonzalez and R. E Woods, "**Digital Image Processing**", Pearson education (Asia)/Prentice Hall of India, 3rd Edition, 2109.
2. R. C. Gonzalez and R. E Woods, "**Digital Image Processing Using MATLAB**", Pearson education (Asia)/Prentice Hall of India, 2nd Edition, 2111.
3. 1.S. Jayaraman, S Esskairajan "**Digital Image Processing**", illustrated, Tata McGraw-Hill Education,2111.

NPTEL/ MOOC Link:

1. https://nptel.ac.in/courses/117105135/
2. https://nptel.ac.in/courses/117105079

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INTRODUCTION TO YAKSHAGANA			
Course Code	**21HU8X86**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning objectives:

The course will enable the students to:

1. Gain basic understanding of Thenku Thittu Yakshagana.
2. Perform basic movements.
3. Understand speech/dialogue, rhythm, Entry and improvisation skills.

UNIT – I

Introduction: Meaning and features, Origin and development, Difference between Thenkuthittu
and Badaguthittu yakshagana. A brief introduction to Thenkuthittu Yakshagana.
Thalas-Aadi thala, yeka thala, Kore thala and Asta Thala with biditha and mukthya- Practice.
Dhingina – Practice…….

14 Hours

UNIT – II

Thalas- Rupaka Thala, Trivide Thala, Jampe thala etc. with biditha and mukthaya.
Dhigina – Practice
Rangasthala Pravesha steps and Eripada ettugade steps.
Revision of all Thalas. ……

14 Hours

UNIT – III

Yakshagana Prasanga Practice- Abhinaya and presentation……..

11 Hours

Performance: The final part of the course is the performance. A Prasanga will be chosen and taught
to the participants and they will perform the same in front of a live audience.

REFERENCE BOOKS:

1. Arthayana: Yakshagana Talamaddale Arthagarike: Ondu Vishleshane: Dr.Ramananda Banari.
2. Yaksha Naatyanjali Thenkuthittu- Sampadaka: Sathish Madivala, Karkala.
3. Yakshagna Shikshana Patya Pustka- Prathamika vibhaga (Karnatka Patya pusthaka sangha-
   Bengaluru)
4. Koralara: YakshaganaVimarsha Sankalana: Dr.M. Prabhakara Joshi
5. Vaagartha Gawrava: (Dr. Joshi Abhinandana Guchaha): Ga. Na. Bhat

MARKETING MANAGEMENT			
Course Code	**21ME8X88**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

Course Learning Objectives:

This Course will enable students to

1. Understand and learn the marketing concepts and their application to profit-orientedand non-profit oriented organizations.
2. Able to apply the marketing concepts to analyze the buying behavior & marketing segments to solve these problems.
3. Understand and learn the need for a customer orientation in product pricing & marketing research in the competitive global business environment;
4. Able to develop an understanding and acquiring skills in how to successfully design and implement marketing plans and strategies.
5. Understand and learn the concept of sales, advertising &distribution of marketing mix and its application in traditional and novel environments characterized by emerging information technologies.

UNIT - I

BASICS

Definition, Marketing Process, Dynamics, Needs, Wants & Demands, Marketing Concepts, Environment, mix, types, philosophies, Selling Vs. Marketing, organization, Industrial Vs. Consumer Marketing, Consumer goods, Industrial goods, Product hierarchy.

8 Hours

BUYING BEHAVIOUR & MARKET SEGMENTATION

Cultural, Demographic factors, Motives, types, Buying decisions, segmentation factors, Demographic, Psychographic & Geographic Segmentation, Process, Patterns.

8 Hours

UNIT - II

PRODUCT PRICING & MARKETING RESEARCH

Objectives, pricing, Decisions and Pricing methods, Pricing Management. Introduction,Uses, process of Marketing Research.

8 Hours

MARKETING PLANNING & STRATEGY FORMULATION

Components of a marketing plan, strategy formulations and the marketing process, implementation, Portfolio analysis, BCG, GEC grids.

8 Hours

UNIT - III

ADVERTISING, SALES PROMOTION & DISTRIBUTION

Characteristics, Impact, goals, types, Sales promotion-Point of Purchase, Unique Selling proposition.

Characteristics, Wholesaling, Retailing, channel design, logistics, Modern Trends inretailing.

7 Hours

Course Outcomes (CO):

At the end of the course the student will be able to

CO1	Explain the basic marketing concepts
CO 2	Interpret the buying behaviour of customers and role of marketing segments
CO3	Explain the role of product pricing and marketing research in the competitive global business environment
CO4	Analyse the marketing plans and strategies.
CO5	Explain the role of sales, advertising and distribution in marketing to achieve thegoals of marketing

TEXTBOOK:

1. Govindarajan. M. 'Modern Marketing Management', Narosa Publishing House,New Delhi, 1999

REFERENCE BOOKS:

1. Philip Kolter, " Marketing Management: Analysis, Planning, Implementation and Control ", 1998.
2. Green Paul.E. and Donald Tull, " Research for Marketing Decisions ", 1975.
3. Ramaswamy.V.S. and S.Namakumari, " Marketing Environment: Planning, Implementation and Control the Indian Context ", 1990
4. Jean Plerre Jannet Hubert D Hennessey Global Marketing Strategies.

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