NITTE EDUCATION TRUST | **NMAM INSTITUTE OF TECHNOLOGY**

College Calendar 2023-24

Department of Computer Science and Engineering

Syllabus
of
4th Year

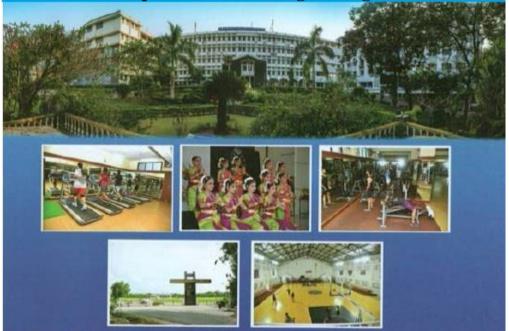**NITTE** EDUCATION TRUST | **NMAM INSTITUTE OF TECHNOLOGY**

(An Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi)

Nitte - 574110, Karnataka, India

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

VII & VIII SEMESTER
Department of
Computer Science & Engineering

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 ರಮಯತೃಪನೀಯ 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 कामनायें 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
(VII & VIII Semester)

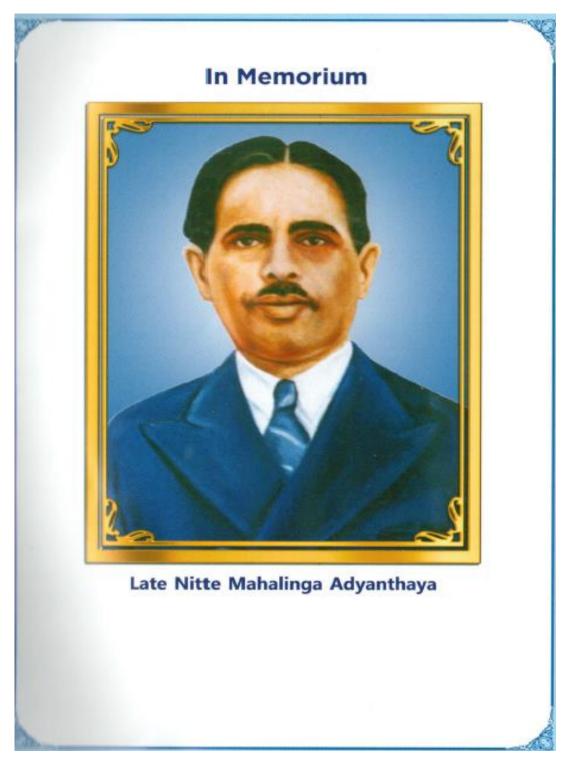**NITTE** EDUCATION TRUST | **NMAM INSTITUTE OF TECHNOLOGY**

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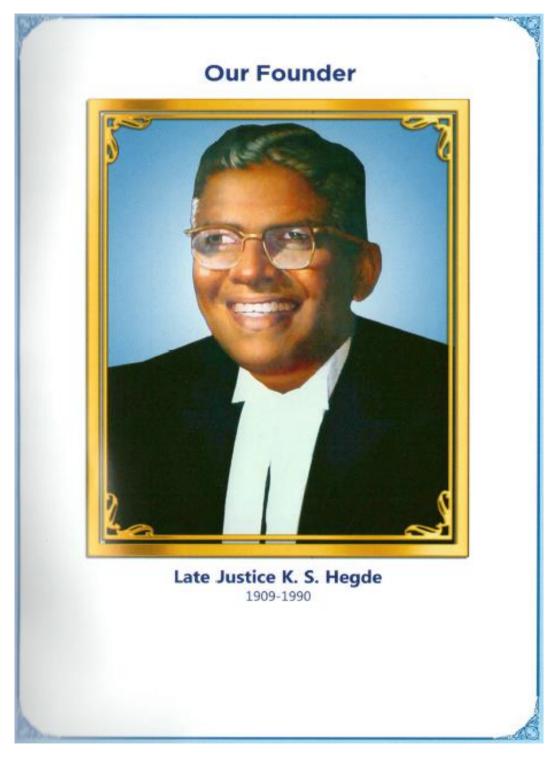ISO 9001:2015 Certified, Accredited by NAAC with "A" Grade
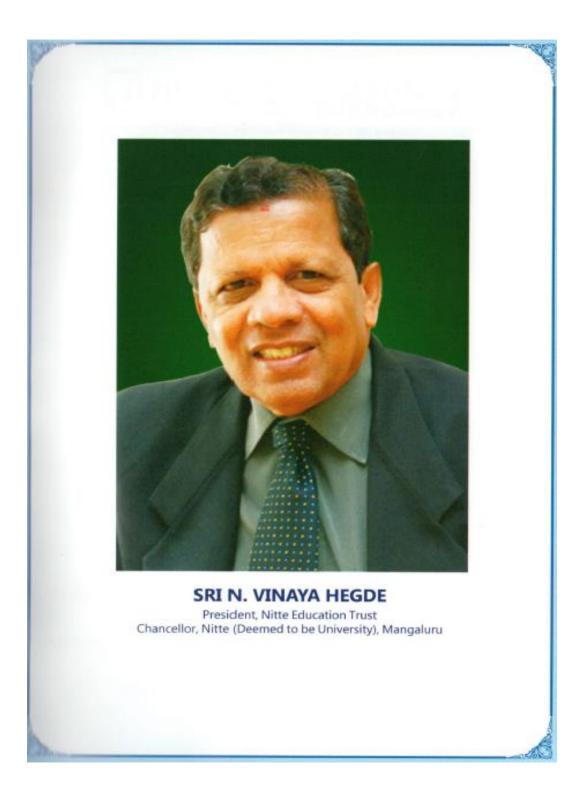
Vision Statement

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

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 2018-19 onwards)

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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

Typical Course Load per Semester			
No. of Courses	**Credits / Course**	**Total Credits**	**Contact Hours per Week**
2 Lecture Courses	3:0:0	6	6
2 Lec. cum Lab Courses	3:0:1	8	10
2 Lec. cum Tut. Courses	3:1:0	8	10
1 Lec. Tut. cum Lab Courses	1:1:1	3	5
Total	**10:2:2**	**25**	**31**

A student must register, as advised by Faculty Advisor, between a minimum of 16 credits and up to a Maximum of 28 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 (=22) or to be within the limits of minimum (=16) and maximum (=28) 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 Sciences (BSC)	24-30
2.	Engineering Sciences (ESC)	15 -20
3.	Humanities, Social Sciences and Management	7- 10
4.	Professional Courses (PCC) – core	70 - 90
5.	Professional Courses (PEC) – elective	18
6.	Open Elective Courses (OE)	06
7.	Project Work (PROJ)	16 (VI – 2, VII-2, VIII-12)
	Seminar on Current Topic	01
8.	Internship	03
9.	Mandatory Learning courses	Non-Credit
Note: **Student can register between 16 to 28 credits per semester** **Total Credits to be earned : 175**		

5.2 The Department Undergraduate Committee (DUGC) will discuss and recommend the exact credits offered for the programme for the above components 'a' to 'g', 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 175.**

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, Constitution of India, 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 8th 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 5th 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 5th, 6th, 7th and 8th 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 (175 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, m ini 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).**

8.9 Grade Card: Each student shall be issued a Grade Card (or Transcript) 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.**

8.10 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) In the event of a student in the final semester failing in a Laboratory course and/or in CIE of a course, he/she could be given 'I' grade for the course. In such a case the concerned course instructor would have the possibility to grant the student extra time not exceeding 12 weeks for completing the course, with the concurrence of the Department/College. If no such extra time is sought/granted, the concerned student would have to re-register for the course in a succeeding semester and take steps to fulfill the requirements of the Degree.

b) 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.

c) 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.

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

CGPA is computed as follows:

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

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, so that the CGPA, in particular, can be made use of in rank ordering the students' performance at a College. If two students get the same CGPA, the tie could be resolved by considering the number of times a student has obtained higher SGPA; But, if it is still not resolved, the number of times a student has obtained higher grades like S,A,B etc. could be taken into account.

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 F 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 175 (135 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
5.75	50 (second class)
6.25	55
6.75	60 (First class)
7.25	65
7.75	70 (Distinction)
8.25	75

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 (175 credits for regular students registered for 4 year degree programmes & 135 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 5th to 8th semester 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 5th to 8th semester 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)).

15 GRADUATION REQUIREMENTS AND CONVOCATION

15.1 A student shall be declared to be eligible for the award of the degree if he/she has
   a) Fulfilled "Award of Degree" Requirements
   b) No Dues to the College, Departments, Hostels, Library, Central Computer Centre and any other centres
   c) No disciplinary action pending against him/her.

15.2 The award of the degree must be recommended by the Senate

15.3   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.

16 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.

17 CONDUCT AND DISCIPLINE

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

17.2 **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.**

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

a) Ragging.

b) Lack of courtesy and decorum; indecent behaviour anywhere within or outside the campus.

c) Willful damage or stealthy removal of any property/belongings of the College/Hostel or of fellow students/citizens.

d) Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.

e) Mutilation or unauthorized possession of Library books.

f) Noisy and unseemly behaviour, disturbing studies of fellow students.

g) 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.).

h) Plagiarism of any nature.

i) Any other act of gross indiscipline as decided by the Senate from time to time.

j) Use of Mobile in the college Academic area.

k) Smoking in College Campus and supari chewing.

l) 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.

17.4 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.

17.5 All cases involving punishment other than reprimand shall be reported to the

Principal.

17.6 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.**

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

COMPUTER SCIENCE & ENGINEERING

VII & VIII SEMESTER

With

Scheme of Teaching

& Examination

DEPARTMENT: COMPUTER SCIENCE & ENGINEERING

Sl. No	Name of the Faculty	Qualification	Designation
1.	Dr. Niranjan.N. Chiplunkar	Ph.D.	Principal
2.	Dr. Jyothi Shetty	Ph.D.	Prof. & Head
3.	Dr. D.K. Sreekantha	Ph.D.	Professor
4.	Dr. P V Bhat	Ph.D.	Professor
5.	Dr. Aravinda C V	Ph.D.	Professor
6.	Dr. Sarika Hegde (On Vacation)	Ph.D.	Professor
7.	Dr. Roshan Fernandes	Ph.D.	Professor
8.	Dr. Sudeepa K. B	Ph.D.	Asso. Prof
9.	Dr. Radhakrishna D	Ph.D.	Asso. Prof
10.	Dr. Raju K	Ph.D.	Asso. Prof
11.	Dr. Anisha P Rodrigues	Ph.D	Asso. Prof
12.	Dr. Pallavi KN	Ph.D.	Asso. Prof
13.	Dr. Sannidhan M.S	Ph.D.	Asso. Prof
14.	Dr. Sandeep Kumar Hegde	Ph.D.	Asso. Prof

15.	Dr. Pradeep Kanchan	Ph.D.	Asst. Prof Gd III
16.	Dr. Vijaya Murari T	Ph.D. (July 2023)	Asst. Prof Gd III
17.	Mr. Ganesh Pai	M.Tech(Ph.D)	Asst. Prof Gd III
18.	Dr. Shabari Shedthi. B	Ph.D	Asso. Prof
19.	Dr. Raghunandan K R	Ph.D	Asso. Prof
20.	Ms. Keerthana B. Chigateri	M.Tech(Ph.D)	Asst. Prof Gd III
21.	Mr. Guruprasad	M.Tech (Ph.D)	Asst. Prof Gd III
22.	Mrs. Minu P. Abraham	M.Tech(Ph.D)	Asst. Prof Gd II
23.	Mr. Sampath Kini	M.Tech(Ph.D)	Asst. Prof Gd II
24.	Mrs. Asmita Poojary	M.Tech(Ph.D)	Asst. Prof Gd III
25.	Mrs. Shwetha G K	M.Tech(Ph.D)	Asst. Prof Gd II
26.	Mrs. Savitha	M.Tech(Ph.D)	Asst. Prof Gd II
27.	Mr. Puneeth R.P	M.Tech(Ph.D)	Asst. Prof Gd III
28.	Dr. Rajalaxmi S Hegde	Ph.D	Asso. Prof
29.	Mrs. Manasa G.R	M.Tech(Ph.D)	Asst. Prof Gd II
30.	Dr. Shashank Shetty	Ph.D	Asst. Prof Gd III
31.	Mr. Sunil Kumar Aithal	M.Tech(Ph.D)	Asst. Prof Gd II
32.	Ms. Ankitha A Nayak	M.Tech, (Ph.D)	Asst. Prof Gd II
33.	Mrs. Shilpa Karegoudar	M.Tech, (Ph.D)	Asst. Prof Gd II
34.	Mr. Ashwin Shenoy M	M.Tech (Ph.D)	Asst. Prof Gd II
35.	Ms. Sowmya P	M.Tech	Asst. Prof Gd II
36.	Mr. Akhilraj V Gadagkar	M.Tech (Ph.D)	Asst. Prof Gd II
37.	Mr. Prithviraj Jain	M.Tech (Ph.D)	Asst. Prof Gd II
38.	Ms. Jayapadmini Kanchan	M.Tech (Ph.D)	Asst. Prof Gd II

39.	Ms. Rajashree	M.Tech (Ph.D)	Asst. Prof Gd I
40.	Mrs. Anusha Anchan	M.Tech (Ph.D)	Asst. Prof Gd I
41.	Mrs, Joylin Priya Pinto	M.Tech (Ph.D)	Asst. Prof Gd I
42.	Mrs. Aishwarya D Shetty	M.Tech (Ph.D)	Asst. Prof Gd I
43.	Mrs. Soumya Ashwath	M.Tech (Ph.D)	Asst. Prof Gd I
44.	Ms. Vaishali B	M.Tech	Asst. Prof Gd I

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

VISION:

To be a center of excellence in Computer science & Engineering education and research, empower the lives of individuals to fulfill their academic excellence, professional passions, and partnership for community development.

MISSION:

To impart both theoretical and practical knowledge through the state-of-the-art concepts and technologies in Computer Science and Engineering.

To inculcate values of professional ethics, leadership qualities and lifelong learning.

To prepare professionals for employment in industry, research, higher education, and entrepreneurship to benefit the society.

Program Educational Objectives (PEOs):

After three years of graduation, our graduates in Computer Science & Engineering should be able to:

Apply appropriate theory, practices, and tools to the specification, design, implementation, maintenance, and evaluation of software systems of Computer Science & Engineering in the workplace, for advanced studies or for societal needs.

Function effectively in the workplace or maintain employment through lifelong learning such as professional conferences, certificate programs or other professional educational activities, ethics, and societal awareness.

Contribute to their computing profession and society by working in teams to design, implement, and/or maintain components of computer software systems.

Program Outcomes (POs):

Engineering Graduates will be able to:

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

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

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

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

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

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

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

8. Ethics: Apply ethical principles and commit to professional ethics and

responsibilities and norms of the engineering practice.

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

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

Apply the knowledge of engineering science and mathematics in solving problems that are appropriate to the discipline.

Apply the knowledge of computing both hardware and software aspects to the solution of real-world engineering problems in the discipline.

Design & develop algorithms, programs, and projects using various software and modern tools appropriate to software industry or Research & Development activities in the discipline.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SCHEME OF TEACHING AND EXAMINATION
VII SEMESTER B.E.

Sl. No.	Sub. Code	Subject	L+T+P	C.I.E	S.E.E	Credits
1	20CS701	Software Testing	3+0+0	50	50	3
2	20CS702	Compiler Design	3+0+0	50	50	3
3	20CSEXX	Elective-IV	3+0+0	50	50	3
4	20CSEXX	Elective-V	3+0+0	50	50	3
5	OEC	Open Elective-I	3+0+0	50	50	3
6	20CS703	Project Phase-I	0+0+6	50	--	2
7	20CS704	Seminar	0+2+0	50	--	1
8	20CS705	Software Testing Lab	0+0+2	50	50	1
9	20CS706	Compiler Design Lab	0+0+2	50	50	1
			TOTAL	450	350	20

SCHEME OF TEACHING AND EXAMINATION

VIII SEMESTER B.E.

Sl. No.	Sub. Code	Subject	Theory /Tuto. /Prac.	C.I.E	S.E.E	Credits
1	20CSEXX	Elective-VI	3+0+0	50	50	3
2	20XXXXX	Open Elective-II	3+0+0	50	50	3
3	20CS801	Project Phase-II	0+0+24	100	100	12
4	20CS802	Internship	0+6+0	50	50	3
			Total	250	250	21

Group – 1		Group – 2	
Architecture, Embedded Systems & General			
Course Code	**Course Name**	**Course Code**	**Course Name**
20CSE11	PARALLEL COMPUTER ARCHITECTURE & PROGRAMMING	20CSE21	Internet of Things
20CSE12	Embedded Systems	20CSE22	Adv. Compilation Tech.
20CSE13	Operations Research	20CSE23	Advanced Algorithms
20CSE14	CAD for VLSI & VHDL	20CSE24	Advanced Computer Architecture
Software Engineering & Development			
Course Code	**Course Name**	**Course Code**	**Course Name**
20CSE31	Advanced Unix Programming	20CSE41	Web Programming
20CSE32	Program Verification	20CSE42	Mobile App Development
20CSE33	Cloud Computing	20CSE43	Software Architecture
		20CSE44	Object Oriented Modeling and Design
Systems, Networks & Security			
Course Code	**Course Name**	**Course Code**	**Course Name**
20CSE51	System Simulation & Modelling	20CSE61	Distributed Systems
20CSE52	Signals & Systems	20CSE62	Digital Signal Processing
20CSE53	Ad hoc Wireless Networks	20CSE63	Adv. Computer Networks
20CSE54	Cryptography & Network Security	20CSE64	Cyber Security
20CSE55	Blockchain Technology		
Intelligent Systems & Analytics			
Course Code	**Course Name**	**Course Code**	**Course Name**
20CSE71	Artificial Intelligence	20CSE81	Big Data Analytics
20CSE72	Pattern Recognition	20CSE82	Image Processing
20CSE73	Social & Web Analytics	20CSE83	Natural Lang. Processing
20CSE74	Neural Network& Deep Learning	20CSE84	Soft Computing
20CSE75	Business Intelligence		

SOFTWARE TESTING

Course Code	:	20CS701		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:

Explain the concept of testing and the testing life cycle.

Use the testing frameworks, process and test management to generate the test plans.

Generate the test plans for a business.

Illustrate the use of automation in testing.

Perform defect management and data management.

UNIT – I

INTRODUCTION TO TESTING – WHY AND WHAT:

Why is testing necessary? What is testing? Role of Tester, Testing and Quality, Overview of STLC

SOFTWARE TESTING LIFE CYCLE – V MODEL:

SDLC vs STLC, different stages in STLC, document templates generated in different phases of STLC, different levels of testing, different types of testing: Functional Testing, API Testing, Usability Testing, Exploratory Testing, Ad-hoc Testing.

Static Testing: Static techniques, reviews, walkthroughs

BASICS OF TEST DESIGN TECHNIQUES:

Various test categories, test design techniques for different categories of tests. Designing test cases using MS-Excel.

14 Hours

UNIT – II

TEST MANAGEMENT:

Documenting test plan and test case, effort estimation, configuration management, project progress management. Use of Testopia for test case documentation and test management.

DEFECT MANAGEMENT:

Test Execution, logging defects, defect lifecycle, fixing / closing defects. Use of Bugzilla for logging and tracing defects.

TEST DATA MANAGEMENT:

Test Data Management –Overview, Why Test Data Management, Test Data Types, Need for Test Data Setup, Test Data Setup Stages, Test data management Challenges. Creating sample test data using MS-Excel.

16 Hours

UNIT – III

BASICS OF AUTOMATION TESTING:

Introduction to automation testing, why automation, what to automate, tools available for automation testing.

BASICS OF AUTOMATION TESTING USING SELENIUM:

Introduction to Selenium, using Selenium IDE for automation testing, using Selenium Web driver for automation testing, understanding TestNG framework with Selenium Web driver for automation testing, Introduction to Maven automation tool.

9 Hours

Course Outcomes:

Upon Completion of this course students will be able to:

1. Apply the knowledge of engineering to understand the various terms and techniques used in testing domain.
2. Identify the different phases of software testing life cycle and types of testing.
3. Analyze test management and test data management processes.
4. Analyze defect management life cycle and use open-source tool for defect management.
5. Design test case and formulate automation testing with demonstration of open-source testing tool.

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	3
CO1	2	2	1											3	3
CO2	2	2	1											3	3
CO3	2	3	1											3	3
CO4	2	3	2											3	3
CO5	2	2	2											3	3

H: Substantial (High)   M: Moderate (Medium)   L: Poor (Low)

TEXTBOOKS:

1. Rex Black , "Managing the Testing Process",2nd edition, John Wiley & Sons, 2001
2. Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black," Foundations of software testing", Cengage Learning EMEA, 2008.
3. Elfriede Dustin, "Implementing Automated Software Testing: How to Save Time and Lower Costs While Raising Quality", Addison-Wesley Professional,2009

REFERENCE BOOKS:

1. Paul C. Jorgensen," Software Testing, A Craftsman's Approach", Third Edition, Auerbach Publications, 2008
2. Mauro Pezze, Michal Young," Software Testing and Analysis –Process", Principles and Techniques, Wiley India, 2009.

E-Books / Online Resources:

1. https://www.softwaretestinghelp.com/selenium-tutorial-1/
2. http://softwaretestingfundamentals.com/software-testing-methods/
3. https://www.tutorialspoint.com/software_testing/software_testing_tutorial.pdf
4. http://www.seleniumhq.org/download/

MOOCs:

http://nptel.ac.in/courses/106105150/

https://freevideolectures.com/course/3625/testing-with-selenium

SEE SCHEME:

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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COMPILER DESIGN					
Course Code	**:**	**20CS702**	**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 lexical analysis, use of regular expressions, transition diagrams, scanner- generator tools and context free grammars.
2. Get the idea of major parsing techniques top-down (recursive-descent, LL(1)) and Bottom up parsers.
3. Discuss LR parsers using items sets and parsing tables.
4. Make use of the principal ideas in syntax-directed definitions, syntax-directed translations and intermediate code representations for assignment statements and boolean expressions.
5. Describe how to construct the basic blocks from intermediate code, code optimization techniques and code generation algorithm.

UNIT – I

INTRODUCTION:

A Simple Compiler, The Phases of a Compiler.
LEXICAL ANALYSIS:

Lexical Analysis, Input Buffering, Specifications of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzer, LEX programming.

SYNTAX ANALYSIS:

Context-free Grammars, ambiguity

SYNTAX ANALYSIS:

The Role of the Parser, Top-down Parsing: No recursive Predictive parsing, LL (1) grammars, Bottom-up Parsing: shift reduce conflicts.

15 Hours

UNIT – II

SYNTAX ANALYSIS:

Introduction to LR Parsers –Simple LR (SLR), LR (0) item set, LR (1) item set, Canonical LR (CLR), Look Ahead LR (LALR) Parsers, YACC programming.

SYNTAX-DIRECTED DEFINITIONS

Constructions of Syntax Trees, Bottom-up Evaluation of S-attributed definitions, L-attributed definitions.

INTERMEDIATE CODE GENERATION:

Intermediate Languages, Assignments, Boolean Expressions.

15 Hours

UNIT – III

Target Machine, Basic blocks and Flow graphs, Next-use information, A Simple Code Generator, Register Allocation and Assignment, The DAG representation of Basic Blocks

Introduction, The Principle of Optimization, Optimization of Basic Blocks, Loops in flow graphs.

09 Hours

Course Outcomes:

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

1. Explain the various phases of compiler Build the regular expressions and transition diagrams by applying the knowledge of finite automata. Develop and Implement tokenizer using high level programming language and LEX Tool

2. Develop top down parsers by applying the knowledge of context free grammar and parsing algorithms.

3. Construct LR item sets by applying the knowledge of Closure and Go to functions. Make use of SLR, CLR and LALR parsing tables to parse the language constructs. Design and Implement parser using high level programming language and YACC Tool.

4. Illustrate Syntax-Directed translation scheme for engineering problems. Apply three address code representations to generate an intermediate code for assignment statement and Boolean expressions.

5. Build a code generator for the intermediate code by applying the knowledge of Basic blocks, address, register descriptors and next use information. Apply code optimization techniques to optimize the target code.

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

Table: Mapping Levels of COs to POs / PSOs

H: Substantial (High)   M: Moderate (Medium)   L: Poor (Low)

TEXTBOOK:

1. Alfred   W Aho, Monica S. Lam,Ravi Sethi, Jeffrey D Ullman, "Compilers-Principles, Techniques and Tools", Addison-Wesley, Second edition, 2007.

REFERENCE BOOKS:

1. Andrew W Apple, "Modern Compiler Implementation in C", Cambridge University Press, 1997.
2. Kenneth C Louden, "Compiler Construction Principles & Practice", Thomson Education, 1997.
3. John R. Levine, Tony Mason, Doug Brown, "LEX and YACC", O'Reilly Publication,1999.

E-Books / Online Resources:

1.   https://www.tutorialspoint.com/compiler_design/index.htm
2.   http://hjemmesider.diku.dk/~torbenm/Basics/basics_lulu2.pdf
3.   http://cnp3book.info.ucl.ac.be/2nd/cnp3bis.pdf

MOOCs:

1.   http://www.nptelvideos.in/2012/11/compiler-design.html

SEE SCHEME:

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 LAB					
Course Code	:	**20CS705**	**CIE Marks**	:	**50**
Teaching Hours /Week (L:T:P:S)	:	**0-0-2-0**	**SEE Marks**	:	**50**
Total Hours	:		**Credits**	:	**01**

Part A:

Open flipkart.com and locate element using name. For the same write a test suite containing minimum 3 test cases using IDE record and playback

Open airasia.com search flight process to automate and locate web element using id. For the same write a test suite containing minimum 3 test cases using IDE record and playback

Open snapdeal.com and search for any web element using name. For the same write a test suite containing minimum of 3 test cases using IDE record and playback

Open Mercury Tours homepage and locate web element using xpath. For the same write a test suite containing minimum 3 test cases using IDE record and play back

Open https://www.google.co.in, automate the following using the specified locators in the Selenium IDE:

Verify Google sign-in using id.

Verify the working of Google Search button for the specified search using name.

Verify the link to Gmail homepage in Google homepage using linktext.

Verify the link to Google images homepage in Google homepage using xpath.

Part B:

Open www.facebook.com application and record login and logout using Selenium IDE. Write test cases by locating the web elements using the CSS Selectors as mentioned below.

Locate the email input box using tag and class.

Locate the password input box using tag and id.

Locate the login button using tag and attribute.

Locate the 'Email or Phone' and 'Password' input boxes using tag, class and attribute.

Automate the following scenario using selenium web driver script.

Fetch Mercury Tour's homepage.

Verify its title.

Print out the result of the comparison.

Close it before ending the entire program.

Automate the following scenario using selenium web driver script.

Launch the browser and open "Gmail.com".

Verify the title of the page and print the verification result.

Enter the username and password.

Click on the Sign in button.

Close the web browser.

Automate the following scenario using selenium web driver script.

Launch the Firefox browser.

Open website, "https://www.flipkart.com".

Print message to display that the website is opened successfully.

Wait for 5 seconds.

Close the browser.

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COMPILER DESIGN LAB						
Course Code	:	**20CS706**		**CIE Marks**	:	**50**
Teaching Hours /Week (L:T:P:S)	:	**0-0-2-0**		**SEE Marks**	:	**50**
Total Hours	:			**Credits**	:	**01**

Implementation of lexical analyzer programs (Lex programs).

Implementation of programs related to compilers (YACC programs)

Design and implementation of a mini project related to the area of compiler design. (Ex: Assemblers, lexical analyzer, any phase of compiler etc.)

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PARALLEL COMPUTER ARCHITECTURE & PROGRAMMING					
Course Code	:	20CSE11		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

Outline the principles of multi-core design.

Illustrate the concept of parallelization and develop threaded parallel programs.

Develop parallel programs on shared memory and distributed memory parallel computers.

Debug and optimize the parallel programs.

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 multi threading, Hyper threading, SMT, Case Study of multi-core processors: Intel, AMD multicore 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-POSIXthreads (Chapter-4Textbook-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:
Identify the concept of multi-core architecture and motivation behind it.
Design a parallel program using the multithreading concept.
Develop parallel programs using parallel programming frameworks.
Describe the concept of multithreaded program debugging.
Develop GPU programs using CUDA.

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		3	3				1			3				
CO2	3	3			3	3		1		2	3	3		2	2
CO3	3	3	3		3	3		1		2	3	3			3
CO4	3	3			3			1		2	3	3			
CO5	3	3	3		3	3		1		2	3	3		3	3

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

TEXTBOOKS:

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 BOOKS

Multicore programming- Increasing performance through software multithreading,-- Shameem Akhter and Jason Roberts, Intel press
Advanced Compiler Design Implementation- Steven S. Muchnick, Morgan Kaufman Publishing 2000

SEE SCHEME:

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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EMBEDDED SYSTEMS

Course Code	:	20CSE12		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. Explain the concepts and principles of Embedded system design.
2. Identify basic building blocks of an embedded system.
3. Assess the benefits of Intel Atom based embedded system in terms of power consumption,
4. Analyze features of various RTOS.
5. Use Intel Atom boards in typical design of systems.
6. Compare various shared data handling techniques.

UNIT – I

Embedded system definition, characteristics, design metrics; Processor, IC and design technologies; Embedded system examples, Digital Camera building blocks, Combinational and sequential building blocks. Use of DSP Processors, SoCs and Microcontrollers in embedded systems. Overview of 8051 microcontroller.   Timers, ADCs, Keypad controllers, LCD controllers, stepper motor and DC motor control, Custom Single Purpose processor design examples: GCD Generator, 4-bit multiplier, Communication bridge. Memory – Composing memory, memory hierarchy and Cache memory, interfacing-Serial, Parallel and Wireless Protocols.

15 Hours

UNIT – II

Introduction to Real – Time Operating Systems, features, Examples of RTOS, typical RTOS functions. Interrupt handling and latency, Shared data problems, Tasks and Task States, Task scheduling, Inter-task communication and synchronization, Semaphores, Message Queues, Mailboxes and Pipes, Reentrant functions, Typical software architectures, Embedded Software development and

testing tools, JTAG debugger, typical system boot flow diagram. Intel ATOM Processor Architecture, Platform architecture and Micro-architecture details.

15 Hours

UNIT – III

Overview of Assembly language programming of ATOM Processor, Low power issues of ATOM processor, ATOM processor series. Intel ATOM Processor kit details, I/O options available, Keyboard and Mouse interface, GPS, GSM and RFID interface – Hands On, Overview of Device drivers.

9 Hours

Course Outcomes:

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

1. Identify basic building blocks of embedded systems.
2. Explain General purpose processor and the purpose of peripherals.
3. Illustrate the uses of RTOS.
4. Explain different features of real time operating systems.
5. Design an embedded system using Intel Atom boards.

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	3		
CO2	3	2										1	3		
CO3	3	3										2	3		
CO4	3											2	3		
CO5		2	3									3		3	

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

TEXTBOOKS:

1. Frank Vahid and Tony Givargis, "Embedded Systems Design – A unified Hardware/Software Introduction", John Wiley, 2002 (Chapter 1, 2, 4).
2. David E.Simon, "An Embedded Software Primer", Pearson Education Asia, First Indian Reprint 2000. (Chapter 6,7, 8, 9).
3. Kenneth Ayala, "8051 Microcontroller Architecture, Programming and Applications", West publishing, 1991 (Selected chapters on Architecture of 8051).

REFERENCE BOOKS:

Lori Matassa and Max Domeika, "Break away with Intel Atom Processors: A guide to Architecture Migration", Intel Press, 2010 (Chapter 3, selected topics of Chapter 4 & 5).

Peter Barry, Patrik Crowley, "Modern Embedded Computing", Morgn Kaufmann publishers, ISBN: 978-0-12-391490-3 2012.

E-Books / Online Resources:

https://www.intel.com/content/www/us/en/products/processors/atom.html
https://en.wikipedia.org/wiki/Embedded_system

SEE SCHEME:

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	:	**20CSE13**		**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. Describe the scope and limitations of OR methods and outline the role of OR techniques in supporting the decisions.
2. Explain the concept of Linear Programming Model (LPM) and formulate Linear Programming problems.
3. Describe the various methods like Simplex Method, revised simplex Method, Big M Method, Two Phase Method, Dual Simplex Method and duality theory and use it on Linear Programming Problems.

4. Describe the formulation of Transportation problems, different methods in Transportation problems like North West Corner Rule, Row minima method, Column minima method, Matrix minima method, Vogel's approximation method, U-V method and use those methods on the respective real-world problems.

5. Describe the formulation of Assignment problems, use Hungarian method in Assignment problems, CPM and PERT (project management techniques) and use it on the respective real-world problems.

UNIT – I

INTRODUCTION

Introduction to OR, nature and meaning, applications, modeling in OR, phases of OR study
LINEARPROGRAMMING
Introduction to Linear Programming through an example, graphical method, formulation of LP model from practical problems, assumptions and properties of linear programming, simplex method, Big M method, 2 phase method, Revised simplex method, Duality theory, Primal and dual relationship.
(Text Book-1: Chapter 2,3,5,6,7,8)

15 Hours

UNIT – II

TRANSPORATION PROBLEMS

Transportation problems, methods to find initial feasible solution and modification to obtain optimal solution (Degeneracy in transportation problems, unbalanced transportation problems

ASSIGNMENTPROBLEM

Mathematical formulation of an assignment problem, unbalanced assignment problem, Travelling Salesman Problem (TSP), Hungarian method.
(Text Book-1: Chapter 15,16)

15 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

(Text Book-1: Chapter 31)   **9 Hours**

Course Outcomes:

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

1. Describe the basics of OR, modelling and applications of OR and the linear programming model.
2. Construct linear programming problem and apply methods like Simplex method, revised simplex method, Big M method, 2 phase method and Dual simplex method to solve the different use cases of linear programming problem.
3. Apply the North West Corner Rule, Row minima method, Column minima method, Matrix minima method, Vogel's approximation method and U-V method to solve the Transportation Problems.
4. Apply the Hungarian method to solve the Assignment Problems and Travelling Salesman Problems.
5. Apply the CPM and PERT project management techniques on the respective use cases to solve the problems related to the use cases.

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												3		
CO2	2	3											3		
CO3	2	3											3	3	
CO4	2	3											3	3	
CO5	2	3											3	3	

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

TEXTBOOK:

1. Operations Research, S. D. Sharma, 17th Revised edition,2014.

REFERENCE BOOKS:

1. Operations Research,Er. Premkumar Gupta,Dr. D.S. Hira, 4th edition, 2015.
2. Introduction to Operations Research - A Computer Oriented Algorithmic Approach, Gillelt B G, McGraw Hill, 2008.
3. Operations Research – An introduction, Hamdy A Taha, PHI, 8th edition,2007.

E-Books / Online Resources:

https://www.tutorialspoint.com/linear_programming/index.asp
https://www.cs.toronto.edu/~stacho/public/IEOR4004-notes1.pdf
http://people.brunel.ac.uk/~mastjjb/jeb/or/contents.html

MOOCs:

Fundamentals of Operations Research IIT Madras Course, Prof. G. Srinivasan:https://swayam.gov.in/

SEE SCHEME:

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.

CAD FOR VLSI AND VHDL					
Course Code	**:**	**20CSE14**		**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:

Explain the VLSI and the fabrication process.

Carryout synthesis process

Give the algorithmic approach for the fabrication

Explain the logical synthesis process.

UNIT - I

OVERVIEW OF VLSI DESIGN:

Overview of VLSI Design: Digital Systems and VLSI: Why Design Integrated Circuits, Integrated Circuit manufacturing, CMOS Technology, Integrated Circuit Design Techniques, Fabrication Process, Transistors, Wires and Vias, Design Rules, Layout Design and Tools, Static Complementary gates, Wires and delay, switch logic, layout design methods, Combinational Logic Testing, Sequential Machines: Introduction, latches and flip flops, FPGAs, PLAs.

HIGH LEVEL SYNTHESIS:

Synthesis, Y-chart partitioning in High level Synthesis, Introduction, Partitioning, Basic Partitioning Methods: Random Selection, Clustering Growth, Hierarchical Clustering

The Min-Cut Partitioning, Scheduling in High level Synthesis, Introduction, Basic Scheduling Algorithms, Time-Constrained Scheduling, Integer Linear Programming Method, Force-Directed Heuristic Method, Resource-Constrained Scheduling, DFG Restructuring

14 Hours

UNIT - II

Data Path Allocation in High level Synthesis, Introduction, Allocation Tasks, Unit

Selection, Functional- Unit Binding, Storage Binding, Interconnection Binding, Interdependence and Ordering, Allocation Methods, Greedy Constructive Approaches, Decomposition Approaches, Clique Partitioning, Left-Edge Algorithm, Weighted Bipartite-Matching Algorithm. Logic Synthesis: Algebraic and Boolean Division Shannon's expansion theorem, Binary Decision Diagrams (BDD), ROBDD, ITE graphs, Combinational Optimization.

16 Hours

UNIT – III

PLAs, Two level optimization PLA Folding, Multilevel logic circuits and Optimization, Physical Synthesis: Floor Planning Placement and Routing, Compaction. VHDL, language constructs, entity and architecture, behavioral description, structural description, examples, Sequential Statements , Testbenches.

9 Hours

Course Outcomes:

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

1. Explain the concepts and terms related to VLSI design and illustrate high level synthesis.
2. Select the synthesis process and process of VLSI circuit.
3. Apply the allocation algorithm for the VLSI design.
4. Illustrate the logic synthesis process.
5. Apply the VLSI method to design and synthesis a real time circuit.

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		
CO2	2	3											2		
CO3	2	3											3	2	
CO4	3												2		
CO5	2	3											2	3	

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

TEXTBOOKS:

1. Niranjan N. Chiplunkar and Manjunath Kothari," VLSI CAD ", PHI Learning Pvt. Ltd. New Delhi, 2011.
2. Wayne Wolf," Modern VLSI Design ", Prentice Hall, Second Edition,1998.
3. Douglas Perry," VHDL Programming", Third edition, McGraw-Hill, 2002.
4. Daniel Gajski, Nikhil Dutt, Allen C-HWunand Steve Y-L Lin," High level synthesis Introduction to chip and system design", Kluwer Academic, Norwell,1992.

REFERENCE BOOKS:

1. Gary Hatchel and Fabio somenzi, "Logic synthesis and Verification Algorithms", Kluwer Academic, Norwell,2001.
2. Naveed Sherwani," Algorithms for VLSI Physical Design Automation", Third Edition, Springer International, 1998.
3. E-BOOKS / ONLINE RESOURCES:
4. http://www.facweb.iitkgp.ernet.in/~isg/CAD/index.html
5. http://www.serc.iisc.ernet.in/~viren/Courses/2008/E0285.html

MOOCS:

https://www.coursera.org/learn/vlsi-cad-logic
http://nptel.ac.in/courses/112102101/

SEE SCHEME:

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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INTERNET OF THINGS					
Course Code	:	20CSE21	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. Learn the IoT Definitions, Design aspects
2. Identify the IoT hardware and software requirements
3. Describe IoT logical and physical design concepts
4. Implement Arduino based IoT Projects
5. Implement Raspberry Pibased IoT Projects

UNIT – I

Introduction

Introduction to IoT: Definition and characteristics, Physical design, Logical design, Enabling technologies, Levels and deployment templates, Examples: Domain specific IoTs

IoT Design and System Engineering

Discuss IoT Requirements, Hardware & Software; Study of IoT sensors, Tagging and Tracking, Embedded Products; IoT Design, (U) SIM Card Technology, IoT Connectivity and Management, IoT Security & IoT Communication.

Python Programming

Data types, Data structures, Control flow, Functions, Modules, Packages, File Handling, Date and time operation, Classes, Python packages of IoT

(Text Book-1:, Chapter 1 to 4)

15 Hours

UNIT – II

IoT Logical Design: IoT Physical Design, Basic building blocks, Raspberry Pi, Linux on Raspberry Pi, Interfaces, Programming on Raspberry Pi with Python

Arduino Based IoT ProjectsDevelopment

Arduino for Project development using components such as LED/Buzzer, Push button/Digital sensor (IR/LDR), Interface motor using relay, Sensing Temperature and Humidity smart phone using Bluetooth.

Raspberry Pi

Raspberry Pi for Project Development: Raspberry Pi platform, GPIO, Establishment and setting, of Raspberry Pi software

(Text Book-1: Chapter 4,5,6 ,7)

15 Hours

UNIT – III

Raspberry Pi based IoT Project Implementation:

Developing projects using components such as LED/Buzzer, Push button/Digital sensor (IR/LDR), Interface motor using relay, Sensing Temperature and Humidity smart phone using Bluetooth.

Text Book-1: Chapter 10, 11, 12, 13   **9 Hours**

Course Outcomes:

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

1. Explain IoT Definitions, Requirements, Systems Design, Sensors, Tags, security communications and apply IoT knowledge in understanding IoT systems and applications

2. Describe Python basics, Control structures, Functions, Modules, Packages, File Handling, Date and time operation, Classes, Python packages of IoTAnalyze the and Develop Simple programs using Python

3. Outline IoT systems Logical and Physical Design Aspects, Develop Arduino simple programmes for LED, Buzzer, Push button, Digital sensors

4. Develop and Implement the simple IoT projects usingArduino boards.

5. Develop and Implement the simple IoT projects usingRaspberry Pi boards

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOKS:

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-On Approach,VijayMadisetti", 2014.
2. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino,Raspberry Pi and BeagleBone Black", 1st Edition, McGraw Hill, 2015.

REFERENCE BOOKS:

1. Dr. SRN Reddy, RachitThukral and Manasi Mishra," Introduction to Internet of Things: A practical Approach", ETI Labs
2. Pethuru Raj and Anupama C. Raman,"The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
3. Jeeva Jose,"Internet of Things", Khanna Publishing House,Delhi
4. Adrian McEwen,"Designing the Internet of Things", Wiley
5. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
6. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media

E-Books / Online Resources:

1. Object-Oriented Analysis and Design with Applications, Grady Booch, Robert A. Maksimchuk, Michael W. Engel,Bobbi J. Young, Jim Conallen,Kelli A. Houston, Third Edition The Addison-Wesley Object Technology Series, 2007
2. Object-Oriented Modeling and Design with UML, James R Rumbaugh, Michael R. Blaha Pearson Education, 21-Nov-2011
3. Object-Oriented Analysis and Design, Ramnath, Sarnath, Dathan, Brahma, ISBN 978-1-84996-522-4,, Springer Publications, 2011.

MOOCs:

https://www.coursera.org/specializations/internet-of-things

https://www.udemy.com/course/iot-internet-of-things-automation-using-raspberry-pi/

https://www.udemy.com/course/arduino-iot-cloud/

LIST OF PRACTICALS

Familiarization with Arduino/Raspberry Pi and perform necessary software installation.

To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.

To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.

To interface DHT11 sensor with Arduino/Raspberry Pi and write a programe to print temperature and humidity readings.

To interface motor using relay with Arduino/Raspberry Pi and write a programe to turn ON motor when push button is pressed.

TO interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.

To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.

To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.

Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.

Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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.

ADVANCED COMPILATION TECHNIQUES					
Course Code	:	20CSE22		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 issues in compiler design and optimization
2. Bring out the issues in code generation.
3. Perform data flow analysis, Partial-redundancy elimination, Region-based analysis; Symbolic analysis.
4. Perform Basic-block scheduling; Global code scheduling; Software pipelining.
5. Describe instruction level parallelism and optimizing for parallelism.

UNIT – I

Introduction and Review: Language processors; The structure of a Compiler; The evolution of programming languages; The science of building a compiler; Applications of Compiler technology; Programming language basics.

Topics in Code Generation: Issues in the design of Code Generator; Peephole optimization; Register allocation and assignment; Instruction selection by tree rewriting; Optimal code generation for expressions; Dynamic programming code generation.

15 Hours

UNIT – II

Machine-Independent Optimizations: The principle sources of optimization; Introduction to data flow analysis; Foundations of data flow analysis; Constant propagation; Partial-redundancy elimination; Loops in flow graphs; Region-based analysis; Symbolic analysis.

Instruction-Level Parallelism: Process architectures; Code-scheduling constraints; Basic-block scheduling; Global code scheduling; Software pipelining.

15 Hours

UNIT – III

Optimizing for Parallelism and Locality: Basic concepts; An example of matrix multiplication; Iteration spaces; Affine array indexes; Data reuse; Array data – dependence analysis; Finding synchronization-free parallelism; Synchronization between parallel loops; Pipelining; Locality optimizations.

9 Hours

Course Outcomes:

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

1. Describe the basic issues in Compiler design and Code generation.
2. Apply the code generation techniques to generate an optimal code for a given high level constructs.
3. Perform flow analysis, Partial-redundancy elimination, Region-based analysis; Symbolic analysis to optimize the code.
4. Construct Basic-block scheduling; Global code scheduling for generating an optimized code.
5. Exploit parallelism and locality concepts for optimizing the given code.

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOK:

Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman: "Compilers - Principles, Techniques and Tools", 2nd Edition, Pearson, 2007.

REFERENCE BOOKS:

1. Charles N. Fischer, Richard J. leBlanc, Jr," Crafting a Compiler with C", Pearson, 1991.
2. Andrew W Apple," Modern Compiler Implementation in C", Cambridge University Press, 1997.
3. Kenneth C Louden," Compiler Construction Principles & Practice", Cengage Learning, 1997.

E-Books / Online Resources:

1. http://www.cs.tau.ac.il/~msagiv/courses/acd/introscribe.doc
2. http://infolab.stanford.edu/~ullman/dragon/w06/w06.html

MOOCs:

1. http://nptel.ac.in/courses/106108113/
2. https://www.mooc-list.com/course/compilers-coursera

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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ADVANCED ALGORITHMS

Course Code	:	20CSE23		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:

To learn the graph search algorithms.

To study about pattern matching and string processing algorithms.

To understand the network flow and basic complexity classes of randomized algorithms.

UNIT – I

Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods. Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG.

14 Hours

UNIT - II

Johnson's Algorithm for sparse graphs, String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.

15 Hours

UNIT – III

Flow networks and Ford-Fulkerson method; Maximum bipartite matching;
Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms.

10 Hours

Course Outcomes:

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

1. Explain the algorithmic problem solving, algorithm design techniques and standard asymptotic notations. Apply the general procedure of non-recursive and/or recursive algorithms to obtain worst-case running times of algorithms using asymptotic analysis.
2. Develop graph search algorithms for solving searching problems in graphs.
3. Develop the optimized pattern matching and string processing algorithms to search the given string in a sentence.
4. Develop and apply the network flow problems for a given a specific application.
5. Describe the probabilistic and randomized algorithms.

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	
CO2	2	2	3						1			1		3	3
CO3	2	3							1			1		3	3
CO4	2	2	3						1			1		3	3
CO5	2	3												2	

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

TEXTBOOK:

T Cormen, C Leiserson, R Rivest, and Stein, "Introduction to Algorithms", 3rd edition, PHI, 2007.

Kenneth A. Berman, Jerome L. Paul," Algorithms", Cengage Learning, 2002.

REFERENCE BOOKS:

Ellis Horowitz, Sartaj Sahini," Fundamentals of Computer Algorithms", Second Edition,Galgotia Publications,2008.

S.G. Akl, "Design and Analysis of Parallel Algorithms", Prentice Hall,1989.

E-Books / Online Resources:

https://www.cs.duke.edu/courses/fall08/cps230/Book.pdf
http://people.csail.mit.edu/moitra/854.html

MOOCs:

https://www.coursera.org/learn/advanced-algorithms-and-complexity
https://onlinecourses.nptel.ac.in/noc17_cs20/preview

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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ADVANCED COMPUTER ARCHITECTURE					
Course Code	:	**20CSE24**	**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 preamble of quantitative principles of computer architecture, various parallel computer models and fundamentals of parallel processing
2. Make use of the concept of pipelining and apply in Linear and Non Linear pipelining processors
3. Learn how to enhance a MIPS processor's ability by understanding challenges like hazards and techniques like static and dynamic scheduling
4. Get an idea of the Synchronization mechanism in Multiprocessors and Optimizations in Cache and memory.
5. Summarize the fundamental aspects of Instruction Level Pipelining and utilize in case studies of Itanium and Intel IA-64 Architecture along with the Hardware and Software.

UNIT – I

FUNDAMENTALS OF COMPUTER DESIGN:

Introduction, Classes of Computers, measuring, reporting and summarizing performance, quantitative principles of computer design (Text 1, chapter: 1).
PARALLEL COMPUTER MODELS:
Shared memory multiprocessors, Distributed-Memory multi computers (Text 3: chap 1.2). Introduction to Parallel processing: Concepts of concurrent and parallel execution, types and levels of parallelism. (Text 2: chapter 3)

PIPELINING:

Introduction, the major hurdle of pipelining- pipeline hazards, How is pipelining implemented. (Text 1, Appendix A). Linear pipeline processors and Non-linear pipeline processors (Text 3, chapter 6).

15 Hours

UNIT – II

EXPLOITING INSTRUCTION LEVEL PARALLELISM:

Concepts and Challenges, Basic compiler techniques for exposing ILP, Reducing branch cost with prediction, overcoming data hazards with dynamic scheduling, hardware based speculation, exploiting ILP using multiple issues and static scheduling, exploiting ILP using Dynamic scheduling, multiple issue and speculation, advanced techniques for instruction delivery and speculation.
(Text 1, chapter 2)

MEMORY HIERARCHY DESIGN:

Introduction; review of concepts. Basic six cache optimization. Eleven Advanced optimizations of Cache performance (self-study); Memory technology and optimizations. (Text 1, chapter 5: 5.1,5.2,5.3)

15 Hours

UNIT – III

HARDWARE AND SOFTWARE FOR VLIW AND EPIC:

Introduction: Exploiting Instruction-Level Parallelism Statically; Detecting and Enhancing Loop-Level Parallelism; Scheduling and Structuring Code for Parallelism; Hardware Support for Exposing Parallelism: Predicated Instructions;

Hardware Support for Compiler Speculation; The Intel IA-64 Architecture and Itanium Processor; Conclusions. (Text 1, Appendix G)

9 Hours

Course Outcomes:

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

1. Describe the principles of computer design using Amdahl's law, principle of locality and parallelism.
2. Demonstrate instruction level parallelism in MIPS processor using instruction pipelining.
3. Elaborate how processor performance is enhanced using software and hardware techniques.
4. Compare cache optimization techniques and choose the suitable one to improve processor performance.
5. Illustrate the hardware and software support for VLIW and EPIC with the case study of Intel IA-64 architecture

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOKS:

1. John L. Hennessey and David A. Patterson, "Computer Architecture, A Quantitative Approach", 4th Edition, Elsevier, 2007
2. Dezso Sima, Terence Fountain, Peter Kacsuk, "Advanced Computer Architectures- A Design space approach", Pearson Education 1997.
3. Kai Hwang, "Advanced Computer Architecture Parallelism, Scalability", Tata Mc Grawhill, 2003

REFERENCE BOOKS:

1. Computer Architecture and Organization, John P. Hayes, Volume 2, McGraw-Hill, 2012
2. Computer Organization and Architecture: Designing for Performance, William Stallings, PHI 9 edition, 2012

E-Books / Online Resources:

1. Computer Architecture and Organization - Design Principles and Applications, B. Govindarajalu, Mcgrawhill HED, Edition: 2nd Edition, 2010
2. Fundamentals of computer organization and architecture, M Abd-El-Barr and Hesham El-Rewini, Wiley Interscience, 2005

MOOCs:

1. NPTEL course on Computer Architecture, by Prof. Madhu Mutyam, PACE Laboratory, Department of computer Science and Engineering, Indian Institute of Technology, Madras.

Online:

https://www.youtube.com/watch?v=Tz7kMR-MAuk

NPTEL course on Advanced Computer Architecture, by Dr. John Jose, Department of computer Science and Engineering, Indian Institute of Technology Guwahati. Online: https://www.youtube.com/watch?v=6oiKaIH7BKU

NPTEL course on Parallel computer Architecture, by Dr. Mainak Chaudhuri, Department of Computer Science and Engineering, Indian Institute of Technology Kanpur.Online: https://nptel.ac.in/courses/106/104/106104024/

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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ADVANCED UNIX PROGRAMMING

Course Code	:	20CSE31		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:

List the file APIs and design the programs to perform file handling operations.

Illustrate the concept of processes and its environment.

Implement programs to handle processes in Linux platform.

Demonstrate the concepts of signals and timers.

Apply inter process communication concept for data exchange between programs.

UNIT – I

The POSIX standards. File types. General File APIs, File handling programs, Makefile - introduction, creation and execution of make file. The Process: Introduction, Mechanism for creating process. The UNIX Kernel support for process. The environment of a UNIX process: Introduction, main function, Process Termination, Command line arguments, Environment List, Memory layout of a C program, Memory allocation, Environment variables, functions.

15 Hours

UNIT – II

Setjmp and longjmp functions, getrlimit, setrlimit Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, Wait3, wait4 functions, Race conditions, exec functions, Interpreter files, System Function.Signals: The Unix Kernel Support for signals, Signal, Signal mask, Sigaction,The SIGCHLD Signal and waitpid functions,The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers. Daemon processes: Introduction, Daemon Characteristics, and Coding Rules.

15 Hours

UNIT – III

Interprocess communications: Overview of IPC Methods, Pipes, popen, Pclose functions, FIFOs, SOCKETS: Introduction, functions, Client/Server Message Handling Example.

9 Hours

Course Outcomes:

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

1. Define and discuss the POSIX standard and different types of files under UNIX platform.
2. Apply various file APIs for developing the file handling programs that can work on UNIX platform.
3. Illustrate the representation of a process and its environment in UNIX and design programs that can use various process APIs for creating and handing the processes in UNIX.
4. Demonstrate the concept of signal and signal handling methods. Use the signal handling APIs for developing programs to handle operating system issues in UNIX platform.
5. Describe the concepts of demon process and inter process communication, design programs to demonstrate the working of inter process communication using suitable APIs of UNIX for achieving the computer communication.

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											3	2	
CO2	2	2	3										2	3	
CO3	2	2	3										2	3	
CO4	2	2	3										2	3	
CO5	1	2	3										2	3	

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

TEXTBOOKS:

1. Terrence Chan, "UNIX System Programming Using C++", Prentice Hall India, 1999. (Chapters 1, 5, 6, 7, 8, 9, 10)
2. W.Richard Stevens," Advanced Programming in the UNIX Environment", Addison –Wesley/PHI, 2013. (Chapters 7, 8, 9, 13, 14, 15)
3. Sumitaba Das, "UNIX-Concepts and Applications", Fourth Edition, Tata McGraw Hill, 2006. (Chapter 9).

REFERENCE BOOKS:

1. Maurice.J.Bach,"The Design of the Unix Operating System", Pearson Education /Prentice Hall of India, First Edition, 1986.
2. UreshVahalia," UNIX Internals, Pearson Education", ASIA, 2001.
3. R. Stones, N. Matthew, "Beginning Linux Programming", Wrox publication, Fourth Edition,2007.

E-Books / Online Resources:

http://www.codeman.net/wp-content/uploads/2014/04/APUE-3rd.pdf
 richard.esplins.org/static/downloads/linux_book.pdf

MOOCs:

http://nptel.ac.in/courses/106101163/56
http://nptel.ac.in/courses/106106156/

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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PROGRAM VERIFICATION					
Course Code	:	**20CSE32**	**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:

Apply the mathematical and logical concepts for programming.

Explain various Programming paradigms.

Identify the specifications of a sequential program.

Write simple program using Dafny.

Perform program verification using Dafny.

UNIT – I

BACKGROUND AND INTRODUCTION:

Sequential, concurrent, and reactive systems, Programming languages and paradigms, Type systems of programming languages, Assigning meaning to programs, operational semantics denotational semantics, Partial and total correctness, Hoare triples, Logic for Program Design: Propositional Calculus, Predicate Calculus.

MATHEMATICAL AND LOGICAL FOUNDATIONS:

Mathematics for Specification: Sets, Relations, Functions and Sequences. Pre-conditions, Post conditions Loop invariants.

15 Hours

UNIT - II

SPECIFICATION OF PROGRAMS:

Variant functions, the state model of programs, Partial and total correctness, Weakest precondition, Guarded commands, Why functional programming matters, Algebraic data types, Higher order functions.

PROGRAM VERIFICATION USING DAFNY PART-I

Methods and functions, pre and post conditions, Assertions, loop invariants, termination, quantifiers, framing, Binary search—an example.

15 Hours

UNIT – III

PROGRAM VERIFICATION USING DAFNY PART-II:

Predicates, sets, sequences, collections, Lemmas, modules: Declaring a new module, Import and export new module, opening modules.

9 Hours

Course Outcomes:

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

1. Identify various paradigms related to programming.
2. Build logical and mathematical specifications for program
3. Testing for specifications of the program.
4. Design and write simple Dafny programs and learn basic syntax.
5. Apply advanced Dafny tool for program verification.

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

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

TEXTBOOKS:

1. Geoff Dromey, "Program Derivation", International Computer Science Series. Addison-Wesley. 1989.
2. Michael Huth and Mark Ryan," Logic in Computer Science - Modeling and Reasoning about Systems", Cambridge University Press. 2004.

REFERENCE BOOKS:

1. Jacques Loeckx, Kurt Sieber," The Foundation of Program Verification", Second Edition, Wiley, India,2013.

E-Books / Online Resources:

http://research.microsoft.com/en-us/projects/dafny/Microsoft Research.
https://www.springer.com/in/book/9780792319658

MOOCs:

http://nptel.ac.in/courses/106102013/

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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CLOUD COMPUTING

Course Code	:	20CSE33		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 fundamental ideas behind Cloud computing, and the evolution of the paradigm, its applicability; benefits as well as current and future challenges.
2. Get the basic idea and principles in Datacenter design and Management and find the importance of Virtualization in Cloud.
3. Get the idea of different Cloud deployment models and Cloud Delivery Models and their security issues.
4. Tell how Cloud Computing solves different problems in the present by considering different Cloud Vendors and their Cloud Design architecture.

UNIT – I

Eras of computing, Parallel vs. Distributed Computing, Elements of Parallel Computing- (What is parallel computing, hardware architecture for Parallel processing, approaches to parallel programming, levels of parallelism, Laws of caution). Elements of Distributed Computing- (General concepts and definitions, components of a distributed system, Architectural styles for distributed computing, models for inter-process communication, Technologies for distributed Computing-Remote procedure call, Service oriented computing). Classic data center, its elements, challenges and benefits. Data center management Steps in transitioning to cloud- consolidation, automation, IT as a service.

Cloud computing Architecture: - Introduction, Cloud reference models-(Architecture, Infrastructure/Hardware as a service, Platform as a service, Software as a service), Types of cloud – (Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds), Economics of cloud, Open challenges.

15 Hours

UNIT – II

Virtualization

Introduction, characteristics of virtualized environments, taxonomy of virtualization technique- (execution of virtualization, other types of Virtualization- Compute, Storage, Network, Desktop, Application). Virtualization and cloud computing, Pros and Cons of virtualization, Technology examples- XEN, VMware, Microsoft Hyper-V.

Security Concerns, Risk Issues: - Cloud Computing- Security Concerns. A Closer Examination: Virtualization, A Closer Examination: Provisioning.

Securing the Cloud: Key Strategies and Best Practices: - Overall Strategy: Effectively Managing Risk-Risk Management: Stages and Activities. Overview of Security Controls, Cloud Security Controls Must Meet Your Needs, NIST Definitions for Security Controls, Unclassified Models, Classified Model the Cloud Security Alliance Approach. The Limits of Security Controls - Security Exposure Will Vary over Time, Exploits Don't Play Fair. Best Practices: Best Practices for Cloud Computing- First Principals, Best Practices across the Cloud Community. Other Best Practices for Cloud Computing- Cloud Service Consumers, Cloud

Service Providers. Security Monitoring.

15 Hours

UNIT – III

The Purpose of Security Monitoring, Transforming an Event Stream, The Need for C.I.A. in Security Monitoring, the Opportunity for MaaS.

Case studies: Public cloud- AWS, Windows Azure, Google App Engine. Private Cloud- Open stack, Eucalyptus.

9 Hours

Course Outcomes:

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

1. Define the concept of cloud computing business need and various networking methods.
2. Express the infrastructure management for cloud environment.
3. Describe the Virtualization at all levels used by XEN, Vmware, Hyper-v
4. Explain the security concepts in cloud computing.
5. Practice the case studies of public cloud such as AWS, Google App Engine and private cloud such as Open Stack.

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOKS:

1. Buyya, Rajkumar, Christian Vecchiola and ThamaraiSelvi, "Mastering Cloud Computing Fundamentals and Applications Programming", McGraw Hill, 2013.
2. Winkler, Vic (J.R), "Securing the Cloud - Cloud Computer Security Techniques and Tactics.",Elsevier Inc, 2012.

REFERENCE BOOKS:

1. Hurwitz, Judith, "Cloud computing for dummies.", Wiley India Pvt Ltd, 2011.
2. Rittinghouse, John,"Cloud computing – implementation, management and security",CRC Press, First edition, 2009.
3. Velte, Toby, Anthony Velte and Robert Elsenpete. "Cloud Computing, A Practical Approach.",Tata McGraw-Hill Authors, 2010.

E-Books / Online Resources:

www.motc.gov.qa/sites/default/files/cloud_computing_ebook.pdf

http://eddiejackson.net/web_documents/The_Definitive_Guide_to_Cloud_Computing.pdf

MOOC:

http://nptel.ac.in/courses/106106129/28

https://www.coursera.org/learn/cloud-computing

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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 PROGRAMMING

Course Code	:	20CSE41		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:

Design static web pages using HTML5 and Cascading Style Sheets (CSS).

Develop client-side validations using JavaScript.

Develop the server-side script using PHP and introduce AJAX concepts.

Design modern web applications using Bootstrap.

Develop AngularJS script at the client side

UNIT – I

HTML5:

Overview of HTML5, New features in HTML5, Removed elements from HTML, HTML5 Semantic elements, HTML5 input types, HTML5 new form elements and attributes, HTML5 Video and Audio.

CASCADING STYLE SHEETS (CSS): Introduction, Levels of style sheets, style specification formats, selector forms, Property Value forms, Font properties, List properties, Color, Alignment of Text, The Box model, Background images, The <span> and <div> tags, Conflict resolution.

THE BASICS OF JAVASCRIPT:

Overview, Object orientation and JavaScript, General syntactic characteristics, Primitives, Operations, and Expressions, Screen output and keyboard input, control statements, Object creation and modification, Arrays, Functions, Constructors, Patterns matching using Regular Expressions, Errors in Scripts.

JAVASCRIPT

The JavaScript Execution Environment, The Document object model, Element access in JavaScript, Events and Event handling, Handling events from Body

elements, Handling events from Button elements, Handling events from Text Box and Password elements.

15 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.

INTRODUCTION TO AJAX:

Overview of Ajax, the basics of Ajax, Example programs using GET and POST method.

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.

16 Hours

UNIT – III

AngularJS:Introduction, AngularJS Expressions, Numbers, Strings, Objects, Arrays, AngularJS Expressions vs. JavaScript Expressions, AngularJS Modules, AngularJS Directives, Data Binding, Repeating HTML Elements, Create New Directives, AngularJS Controllers, Controller Methods, AngularJS ng-model Directive, AngularJS Scope, AngularJS Filters, AngularJS Services

NodeJS: Introduction to Node.js- Installing Node.js - Using Events, Listeners, Timers, and Callbacks in Node.js, Introduction to Mongo DB- Accessing

MongoDB from Node.js.

8 Hours

Course Outcomes:

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

1. Design static web pages using HTML5 and Cascading Style Sheets (CSS).
2. Develop client-side validations using JavaScript.
3. Develop the server-side script using PHP and AJAX concepts.
4. Design modern web applications using Bootstrap.
5. Develop interactive AngularJS script at the client side.

COs	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	1	2	3											3	3
CO2	2	3												3	3
CO3	2	3												3	3
CO4	1	2	3											3	3
CO5	1	2												3	3

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

TEXTBOOKS:

Robert W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson, 2014.

Jake Spurlock, "Bootstrap-Responsive Web Development", O'Reilly publications, 2013.

Ari Lerner, Ng-book, "The complete book on Angular JS", 2013.

REFERENCE BOOKS:

M. Deitel, P.J. Deitel, A. B. Goldberg,"Internet& World Wide Web How to Program",   Third Edition, Pearson education, 2004.
Chris Bates,"Web Programming Building Internet Applications", Third Edition, Wiley India, 2006

E-Books / Online Resources:

https://www.cs.uct.ac.za/mit_notes/web_programming.html

http://www.multitech.ac.ug/uploads/IntroductiontoWebProgramming.pdf

MOOCs:

http://nptel.ac.in/courses/106106156/2

https://www.coursera.org/learn/web-development

SEE SCHEME:

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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MOBILE APPLICATION DEVELOPMENT

Course Code	:	20CSE42	CIE Marks	:	50
Teaching Hours /Week (L:T:P:S)	:	1-1-2-0	SEE Marks	:	50
Total Hours	:	39	Credits	:	03

Course Learning Objectives:

This Course will enable students to:

Describe the architecture and overview of android.

Develop a mobile application on android platform using UI components and Android Components.

Demonstrate data handling in Android Develop a mobile application on android platform using SQLite

Build an Android web service.

Develop application to demonstrate google map and navigation.

UNIT – I

INTRODUCTION AND OVERVIEW:

Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android Platform, setting up the mobile app development environment along with an emulator in Android Studio, Hello World Example.

USER INTERFACE DESIGNING:

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).

Textbook1 , Chapters: 1, 2, 4)

15 Hours

UNIT – II

ANDROID APPLICATION COMPONENT:

Activity –states and life cycle, interaction amongst activities. Services – state and lifecycle. Notifications, Broadcast Receivers, Content Provider, Fragments. Intents: Implicit and Explicit Intent

APP FUNCTIONALITY BEYOND USER INTERFACE:

Threads, Async task, Notification, Location Based Service, Telephony and SMS APIs, Text to Speech, Camera.
Android Web Service, Android Google Maps, Android Bluetooth, Navigation.
(Textbook1 , Chapters: 4, 5,10)

15 Hours

UNIT – III

DATA HANDLING:

Shared preferences, mobile databases such as SQLite, and enterprise data access, Android multimedia: Multimedia-audio/video playback and record. Sensors: Location awareness and native hardware access (sensors such as accelerometer and gyroscope).

(Textbook1 , Chapters: 6, 9)

9 Hours

Course Outcomes:

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

1. Understand the tool like Android Platform and Android Studio Environment to familiarize with android development environment.
2. Design the user interface using the Android UI Components and Android Application Components.
3. Apply the concepts such as SQLite, shared preference, files, broadcast, notifications, and other APIs for developing the android applications.
4. Develop Application using Sensor telephony APIs.
5. Apply the google APIs to build location-based app development

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	3	3		1	1		2	2	1	2	1	2	3	3
CO2	3	3	3		1	1		2	2	1	2	1	2	3	3
CO3	3	3	3		1	1		2	2	1	2	1	2	3	3
CO4	3	3	3		1	1		2	2	1	2	1	2	3	3
CO5	3	3	3		1	1		2	2	1	2	1	2	3	3

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

TEXTBOOKS:

1. Anubhav Paradhan, Anil V Deshpande, "Mobile apps Development ",First Edition, Wiley, 2014.
2. Barry Burd , "Android Application Development All in one for Dummies", Second Edition Wiley, 2015.
3. SAMS,"Teach Yourself Android Application Development in 24 Hours",First Edition, Sams Publishing,2010.

REFERENCE BOOKS:

1. Wei-Meng Lee," Beginning Android Application Development", Wrox Publication, 2011.
2. Reto Meier," Professional Android 4 Application Development", Wrox Publication, 2012.

E-Books / Online Resources:

https://www.tutorialspoint.com/android/index.htm

https://www.javatpoint.com/android-tutorial

https://developer.android.com/guide/

MOOCs:

http://nptel.ac.in/courses/106106156/

https://www.youtube.com/watch?v=SYoNOvdZ3M&list=PLonJJ3BVjZW6CtAMbJz1XD8ELUs1KXaTD&index=19

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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 ARCHITECTURE					
Course Code	:	20CSE43	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 various architectural influences and its qualities on the organizational requirements.
2. Make use of different case studies to critically evaluate the suitability of a software architecture.
3. Develop the architecture using different architecture styles.
4. Choose the different architectural pattern and design patterns to design the architecture that enhances the architectural capabilities.
5. Document the software architecture to communicate the system evolution strategy to the stakeholder.

UNIT - I

INTRODUCTION:

The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a "good" architecture? What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views (Text Book-1: Chapter 1: 1.1 ,1.2,1.3, Chapter 2: 2.1,2.2,2.3,2.4,2.5)

QUALITY:

Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities. Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics.
(Text Book-1: Chapter 4: 4.1, 4.2,4.3,4.4,4.5,4.6,4.7, Chapter 5:5.1,5.2,5.3,5.4,5.5,5.6, 5.7).

15 Hours

UNIT - II

ARCHITECTURAL STYLES AND CASE STUDIES: Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures. Case Study: Mobile robotics.
(Text Book-2: Chapter 2: 2.1, 2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9,2.10, Chapter 3:3.3)
ARCHITECTURAL PATTERNS: Introduction, Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control. Adaptable Systems: Microkernel.
(Text Book-2: Chapter 2: 2.1, 2.3,2.4,2.5)

15 Hours

UNIT – III

DESIGNING AND DOCUMENTING SOFTWARE ARCHITECTURE: Architecture in the life cycle; designing the architecture; Forming the team structure; Creating a skeletal system. Uses of architectural documentation; Views; choosing the

relevant views; Documenting a view; Documentation across views. (Text Book-1: Chapter 7: 7.1, 7.2,7.3,7.4, Chapter 9: 9.1,9.2,9.3,9.4,9.5)

9 Hours

Course Outcomes:

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

1. Identify the requirements which influence the architecture and development strategy.
2. Analyze the architecture using different case studies and quality attributes.
3. Recognize architecture styles to design the architecture.
4. Apply different architecture patterns and design patterns to develop architecture that yields the system that has new organizational capabilities and requirements.
5. Describe the different views to document the architecture.

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

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

TEXTBOOKS:

1. Len Bass, Paul Clements, Rick Kazman,"Software Architecture in Practice",SecondEdition, Pearson Education, 2003.
2. Frank Buschmann, Regine Meunier, Hans Rohnert,PeterSommerlad, Michael Stal, "Pattern-Oriented Software Architecture", A System of Patterns -Volume 1 , John Wiley and Sons, 2006.
3. Mary Shaw and David Garlan, "Software Architecture-Perspectives on an Emerging Discipline", Prentice-Hall of India, 2007.

REFERENCE BOOKS:

1. E. Gamma, R. Helm, R. Johnson, J. Vlissides, "Design Patterns- Elements of Reusable Object-Oriented Software ", Addison- Wesley, 1995.

E-Books / Online Resources:

http://www.hillside.net/patterns/
https://www.cs.cmu.edu/afs/cs/project/vit/ftp/pdf/intro_softarch.pdf
https://www.ics.uci.edu/~yuzok/software-architecture.html

MOOCs:

http://www.nptel.ac.in/syllabus/106104027/
https://www.coursera.org/learn/software-architecture

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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 MODELLING AND DESIGN					
Course Code	:	20CSE44		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:

Recall the object-oriented concepts, three pillars of object-orientation and their benefits.

Illustrate the various models that can be used to demonstrate the object-oriented design of any real world software systems.

Make use of use-cases for interpreting the requirements and develop class diagrams that model both the domain state model and design model of a software system.

Examine the dynamic aspects of a software system, model the interaction diagrams to justify those aspects.

Relate how the UML constructs are used to represent various models.

UNIT – I

Introduction:

What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling 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; Navigation of class models; Practical tips.

Advanced Class Modeling: Advanced object and class concepts; Association ends; N-ary associations;

(Text Book-1: Chapter 1 to 4.3)

Advanced Class Modeling: Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.

State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.

Advanced State Modeling: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.

Interaction Modeling: Use case models; Sequence models; Activity models; Use case relationships; Procedural sequence models; Special constructs for activity models

(Text Book-1: Chapter 4.4,5,6 ,7)

15 Hours

UNIT – II

Process Overview, System Conception: Development stages; Development life cycle, 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.

Application Analysis: Application Analysis: Application interaction model;

Application class model; Application state model; Adding operations.
(Text Book-1: Chapter 10,11,12, 13)

System Design: Overview; Estimating performance; Making a reuse plan; Breaking a system in to sub- systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.
(Text Book-1: Chapter 14)

15 Hours

UNIT – III

Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Re-cursing downwards, Re-factoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example

Implementation Modeling: Overview of implementation; Fine- tuning classes; Fine-tuning generalizations; Realizing associations; Testing

Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.
(Text Book-1: Chapter 15,16,17,23

9 Hours

Course Outcomes:

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

2. Acquire Knowledge about different software systems modelling techniques, class design and associations by making use of concept diagrams
3. Illustrate Advanced Class, State and Interaction models of software systems utlilizing class, state and interaction diagrams
4. Outline the system concepts, Development Life Cycle, Analyse and Define Problem Statement, Analyse the system domain, application, class, state and interaction models
5. Overview of system design, estimate performance, divide it into subsystems, managing resources, selecting appropriate architectural styles
6. Describe class design, Implementation modelling, Legacy systems and Reverse engineering concepts, realizing use cases, associations, Fine Tuning Classes, Constructing Interaction and State models.

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			1							1		2	3
CO2	2	2	3		1							1		2	3
CO3	2	3			1							1		2	3
CO4	2	2	3		1							1		1	3
CO5	1	3			1							1		1	3

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

TEXTBOOK:

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

REFERENCE BOOKS:

1. Object-Oriented Analysis and Design with Applications, Grady Booch et al, 3rd Edition, Pearson Education, 2007.
2. Practical Object-Oriented Design with UML, Mark Priestley, 2nd Edition, Tata McGraw-Hill, 2003.
3. Object-Oriented Design with UML and JAVA, K. Barclay, J. Savage, Elsevier, 2008.
4. The Unified Modeling Language User Guide, Booch, G., Rumbaugh, J., and Jacobson I, 2nd Edition, Pearson, 2005.
5. Object-Oriented Systems Analysis and Design Using UML, Simon Bennett, Steve McRobb and Ray Farmer, 2nd Edition, Tata McGraw-Hill, 2002.

E-Books / Online Resources:

1. Object-Oriented Analysis and Design with Applications, Grady Booch, Robert A. Maksimchuk, Michael W. Engel, Bobbi J. Young, Jim Conallen, Kelli A. Houston, Third Edition The Addison-Wesley Object Technology Series, 2007

2. Object-Oriented Modeling and Design with UML, James R Rumbaugh, Michael R. Blaha Pearson Education, 21-Nov-2011

3. Object-Oriented Analysis and Design, Ramnath, Sarnath, Dathan, Brahma, ISBN 978-1-84996-522-4, Springer Publications, 2011.

MOOC:

Object-Oriented Design, https://www.coursera.org/learn/object-oriented-design
Object-Oriented Analysis and Design ,
https://nptel.ac.in/courses/106/105/106105153/#

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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SYSTEM SIMULATION & MODELLING					
Course Code	:	**20CSE51**	**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. Describe the appropriateness of the simulation, its application, types of simulation model, steps in simulation study and general principles in simulation and concepts in discrete-event simulation.

2. Describe the generation of random numbers and pseudo-random numbers and apply techniques for generating random numbers.

3. Illustrate and apply the techniques of random variate generation, Accept-Rejection techniques and input modelling on relevant exercise problems.

4. Explain the verification, validation and calibration of simulation models.

5. Describe the high-level computer simulation, CPU simulation and memory simulation.

UNIT – I

INTRODUCTION TO SIMULATION:

When Simulation is the Appropriate Tool; When Simulation Is Not Appropriate; Advantages and Disadvantages of Simulation; Areas of Application; Systems and System Environment; Components of a System; Discrete and Continuous Systems; Model of a System; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study. General Principles: Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling.
(Text Book-1: Chapter 1, Chapter 3: 3.1)

15 Hours

UNIT – II

RANDOM-NUMBER GENERATION:

Properties of Random Numbers; Generation of Pseudo-Random Numbers; Techniques for Generating Random Numbers; Tests for Random Numbers. Random-Variate Generation: Inverse Transform technique: Exponential Distribution, Uniform Distribution, Discrete Distributions; Acceptance-Rejection Technique: Poisson Distribution. Input Modeling: Data Collection; Identifying the distribution with Data; Parameter Estimation; Goodness of Fit Tests; Selecting Input Models without Data; Multivariate and Time-Series Input Models.
(Text Book-1: Chapter 7, Chapter 8: 8.1.1,8.1.2,8.1.7,8.2.1, Chapter 9:9.1,9.2,9.3,9.4,9.

15 Hours

UNIT – III

VERIFICATION AND VALIDATION OF SIMULATION MODELS:

Model Building, Verification and Validation; Verification of Simulation Models; Calibration and Validation of Models. Simulation of Computer Systems: Introduction; Simulation Tools; Model Input; High-Level Computer-System Simulation; CPU Simulation; Memory Simulation.
(Text Book-1: Chapter 10, 14)

9 Hours

Course Outcomes:

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

1. Describe the appropriateness of the simulation, its application, types of simulation model, steps in simulation study and general principles in simulation and concepts in discrete-event simulation.
2. Describe the generation of random numbers and pseudo-random numbers and apply techniques for generating random numbers.
3. Illustrate and apply the techniques of random variate generation, Accept-Rejection techniques, input modelling on relevant exercise problems.
4. Illustrate the verification, validation and calibration of simulation models.
5. Illustrate the high-level computer simulation, CPU simulation and memory simulation.

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOK:

1. Jerry Banks, John S. Carson, Barry L. Nelson, David M. Nicol, "Discrete-Event System Simulation",Third Edition, Prentice-Hall India,2000
2. REFERENCE BOOKS:
3. Averill M. Law, W. David Kelton, "Simulation Modeling and Analysis" ,Third Edition, McGrawHill,2000.
4. Geoffrey Gordon, "System Simulation", Second Edition, Prentice-Hall India,1978.

E-Books / Online Resources:

1. https://ptolemy.berkeley.edu/books/Systems/PtolemyII_DigitalV1_02.pdf
2. https://epdf.tips/system-modelling-and-simulation.html
3. MOOCs:https://www.coursera.org/learn/modeling-simulation-natural-processes
4. https:// swayam.gov.in

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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SIGNALS AND SYSTEMS					
Course Code	:	20CSE52	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 the student to:

1. Explain the concept of signals.
2. Formulate the signal in the form of equations.
3. Represent the signal in Fourier form and apply this.
4. Demonstrate system using differential/difference equation
5. Perform Z transform on the signals.

UNIT – I

INTRODUCTION:

Definitions of a signal and a system, classification of signals, basic operations on signals, elementary signals, systems viewed as interconnections of operations, properties of systems. Time-domain representations for LTI Systems: Convolution, impulse response representation, properties of impulse response representation, differential and difference equation representations, block

diagram representations.

15 Hours

UNIT – II

FOURIER REPRESENTATION FOR SIGNALS :

Introduction, Fourier representations for four signal classes, orthogonality of complex sinusoidal signals, DTFS representations, continuous-tine-Fourier-series representations, DTFT and FT representations, properties of Fourier representations. Application of Fourier representations : Frequency response of LTI systems, solution of differential and difference equations using system function, Fourier transform representations for periodic signals, sampling of continuous time signals and signal reconstruction.

15 Hours

UNIT – III

Z-TRANSFORMS

Introduction, Z-transform, properties of ROC, properties of Z-transforms, inversion of Z-transforms, transforms analysis of LTI systems, transfer function, stability and causality, unilateral Z-transforms and its application to solve difference equations

9 Hours

Course Outcomes:

Upon completion of this course, students will be able to:
1. Classify different types of signals and systems.
2. Find the output of a LTI system.
3. Formulate the basic operations on signals.
4. Demonstrate system using differential/difference equation
5. Analyze signals & LTI systems in frequency & Z domain.

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOK:

1. Simon Haykin and Barry Van Veen, "Signals and Systems", John Wiley and Sons, 2001, Reprint 2002(Chapters: 1.1 to 1.8, 2.2 to 2.5, 3.1 to 3.6, 4.2 to 4.3, 4.7, 7.1 to 7.6, 7.8).

REFERENCE BOOKS:

1. Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, "Signals and Systems", Pearson Education Asia,Second edition, 1997, Indian reprint 2002.
2. Dr. D.ganesh Rao and Satish Tunga, "Signals and Systems-A Simplified Approach", Sanguine Technical Publishers, 2003-04.

E-Books / Online Resources:

1. http://jpkc.gnnu.cn/jpkc/Signal/ziliaoxiazai/OppenheimSignalsAndSystems.pdf
2. https://web.itu.edu.tr/hulyayalcin/Signal_Processing_Books/Signals_and_Systems.pdf

MOOCs:

1. https://ocw.mit.edu/resources/signals-and-systems-spring-2011/video-lectures/
2. https://www.coursera.org/courses/signalsandsystems

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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 WIRELESS NETWORKS					
Course Code	:	**20CSE53**	**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. Distinguish the characteristics of ad hoc Wireless networks with other Wireless networks.
2. Identify Ad-Hoc Wireless networks, issues, classification of MAC Protocols.
3. Describe and distinguish different types of ad hoc Routing Protocols, TCP over Ad hoc Protocol and a brief introduction to security issues in ad hoc Wireless networks.

UNIT – I

Review of Wireless Networks: IEEE Wireless Standard, Basic 802.11 MAC layer mechanisms, CSMA/CA mechanisms and other MAC layer functionalities.

Ad hoc Networks: Introduction, Issues in Ad Hoc Wireless networks, Ad hoc Wireless internet.

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.

Classification of MAC Protocols: Contention based protocols: MACAW, FAMA busy tone protocols, receiver-initiated protocol: MARCH. Contention based protocols with reservation mechanisms: DPRMA, HRMA, FPRP. Contention-based MAC protocols with scheduling mechanism: DPS&MA.

Routing protocols for Ad hoc Wireless Networks: Introduction, Issues in designing a routing Protocol for Ad hoc Wireless Networks, Classification of routing Protocols. **15 Hours**

UNIT – II

Table drive routing protocol: DSDV, WRP, CGSR. On-demand routing protocol: DSR, AODV, LAR, FORP.

Hybrid routing protocol: CEDAR, ZRP. Hierarchical routing protocols: FSR. Metrics used by power aware routing protocols.

Transport layer protocols for Ad hoc Wireless Networks: Introduction, Issues in designing a transport layer Protocol for Ad hoc Wireless Networks, Design goals of a transport layer protocol for Ad hoc Wireless Networks, Classification of transport layer solutions, TCP over Ad hoc Wireless Networks: TCP-F, TCP with ELFN, TCP-BuS, ATCP, Split TCP. Other transport layer protocols for Ad hoc Wireless Networks: ACTP, ATP.

15 Hours

UNIT – III

Security in Wireless Ad hoc Wireless Networks: Network Security requirements, Issues & Challenges in security provisioning, Network security attacks, Key Management, Secure routing in Ad hoc Wireless Networks: SAR, SEAD, Security-Aware AODV.

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.

9 Hours

Course Outcomes:

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

1. Explain the Wireless networks and MAC layer functionalities.
2. Identify and discuss the contentions-based MAC protocols and routing protocols of ad hoc Wireless networks.
3. Identify and interpret the network protocols that would facilitate the exchange of data between the Wireless networks.
4. Discuss the issues related to TCP/IP Transport layer protocols.
5. Describe the security and QoS issues and challenges with ad hoc Wireless networks.

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOK:

1. Siva Ram Murthy and B S Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Second Edition, C. Pearson Education, 2005.

REFERENCE BOOKS:

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

E-Books / Online Resources:

1. https://www.springer.com/in/book/9781848003279
2. https://www.springer.com/in/book/9783319744384
3. https://www.sciencedirect.com/journal/ad-hoc-networks

MOOCs:

https://swayam.gov.in/course/4408-Wireless-adhoc-and-sensor-networks

http://nptel.ac.in/courses/106105160/

3.https://onlinecourses.nptel.ac.in/noc17_cs07/

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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CRYPTOGRAPHY AND NETWORK SECURITY					
Course Code	:	**20CSE54**	**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 basic principles of Network security and its applications.
2. Design various block ciphers and design various cryptographic algorithms.
3. Use the theorems needed for cryptographic operations and compare & contrast different types of cryptography.
4. State the concepts & uses of Digital signature and web security.
5. Demonstrate the need and summarize the concept of Secure Electronic Transactions & Intrusion detection system.

UNIT – I

Overview: Services, Mechanisms and Attacks. A Model   of Network Security.

Conventional Encryption Techniques : Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography.

Block Cipher and the Data Encryption Standard: Simplified DES. Block Cipher Principles. The Data Encryption Standard, the Strength of DES, Block Cipher Design Principles, Block Cipher Modes of Operations. Triple DES, Blowfish,

Random Number Generation

15 Hours

UNIT – II

Number Theory: Group, cyclic groups, Modular arithmetic operation, GCD operation. Prime Numbers, Fermat's and Euler's Theorems, Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm, attacks on RSA, Key Management: Diffie- Hellman Key Exchange. Digital signature, DSS, Elliptic Curve Cryptography.

Network Security: Electronic Security, pretty good privacy, IP Security overview, IP Security architecture, Authentication Header, encapsulating security payload, Combining Security Associations.

15 Hours

UNIT – III

Web Security: Web Security Requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction. Intruders, Viruses, and Worms: Viruses and Related Threats, Firewalls: Firewall Design Principles, Trusted Systems.

9 Hours

Course Outcomes:

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

1. Identify Explain basic network security model and its applications.
2. Design and Classify various block ciphers and its usages.
3. Apply and Illustrate the concept public key cryptography & apply digital signatures in email processing.
4. Describe different techniques used in key exchange protocols.
5. Apply the knowledge of usages of email-security, IP security and web
6. security.

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	3											2	3	
CO2		2	3										2	2	
CO3	2	3											3	3	
CO4	2	2	3										2	3	
CO5	2	3											2	3	

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

TEXTBOOKS:

1. William Stallings, "Cryptography and Network Security", Third Edition, Pearson Education, 2003.
2. W. Stallings, Prentice Hall, 2005. Applied cryptography, 2nd edition, B. Schneier, John Wiley & Sons, 1996.
3. REFERENCE BOOKS:
4. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security: Private communication in a Public World", Second Edition, Pearsdon Education Asia, 2002.
5. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill, 2003.

E-Books / Online Resources:

1. https://wanguolin.github.io/assets/cryptography_and_network_security.pdf
2. https://www.wileyindia.com/cryptography-and-security.html

MOOCs:

1. http://nptel.ac.in/courses/106105031/
2. https://www.mooc-list.com/tags/cybersecurity

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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BLOCKCHAIN TECHNOLOGY					
Course Code	:	20CSE55	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:

Understand conceptual working of block chain technology.

Devise the block chain technology to innovate and improve business processes.

Get the idea of working with Ethereum and Smart Contracts in Block Chain Environment.

Solving real-world problems using Remix IDE and Truffle.

Describe and illustrate the idea of Hyperledger Fabric.

UNIT – I

Introduction: What Is the Blockchain? What is Bitcoin? The Connected World and Blockchain: The Fifth Disruptive Computing Paradigm. How blockchain works? How blockchain accumulates blocks? Tiers of blockchain technology, Features of a blockchain, Types of blockchain.

Blockchain Currency: Technology Stack: Blockchain, Protocol, Currency, The Double-Spend and Byzantine Generals' Computing Problems, How a Cryptocurrency Works.

Benefits and limitations of blockchain : Technical Challenges, Business Model Challenges, Scandals and Public Perception, Government Regulation, Privacy Challenges for Personal Records, Overall: Decentralization Trends Likely to Persist.

Consensus: Consensus mechanism, Types of consensus mechanisms, Consensus in blockchain, CAP theorem and blockchain

(Test Book 1 : Chapter 1,6   TextBook 2 : Chapter 1)

15 Hours

UNIT – II

Decentralization: Decentralization using blockchain, Methods of decentralization, How to decentralize, Computing power and decentralization, DO, DAO,DAC,DAS,Dapps,

Ethereum and Smart Contracts: Definition, Ricardian contracts, Deploying smart contracts on a blockchain, Ethereum Blockchain, Ethereum Network, Components of the Ethereum, ecosystem, Ether cryptocurrency, Introducing Solidity, Global Variables and Functions, Expressions and Control Structures, Writing Smart Contracts, Truffle Basics and Unit Testing, Debugging Contracts Remix IDE: Programs execution.

(TextBook 2: Chapter 1,2,9,10 TextBook 3: Chapter 3,4,5,6,9,10)

15 Hours

UNIT – III

Hyperlegder: Fabric,The reference architecture, Requirements and design goals of Hyperledger Fabric, Membership services, Blockchain services, Components of the fabric, Chain code implementation, The application model, Consensus in Hyperledger Fabric, The transaction life cycle in Hyperledger Fabric

(TextBook 2: Chapter 15)

9 Hours

Course Outcomes:

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

1. Explain the block chain technology.
2. Understand the significance of Consensus and working of cryptocurrency.
3. Develop block chain-based solutions and write smart contract using Remix IDE and Ethereum frameworks.
4. Build and deploy block chain application using Truffle Suite.
5. Create and deploy a block chain network using Hyperledger Fabric SDK

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOKS:

1. Melanic Swan, "Block Chain: Blueprint for a New Economy", O'Reilly, 2015.
2. Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing.
3. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing

REFERENCE BOOKS:

1. Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, Delhi.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer", Import, 2018.
3. Josh Thompsons, "Block Chain: The Block Chain for Beginners-Guide to Block chain Technology and Leveraging Block Chain Programming".
4. Daniel Drescher, "Block Chain Basics", Apress; 1st edition, 2017.

MOOCs:

1. https://www.coursera.org/specializations/blockchain
2. https://www.edx.org/learn/blockchain
3. https://nptel.ac.in/courses/106/105/106105184/

SEE SCHEME:

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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DISTRIBUTED SYSTEMS

Course Code	:	20CSE61		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. Identify the issues involved in designing distributed systems.
2. Describe various synchronization methods of distributed methods.
3. Analyze process migration approach and distributed deadlock management.
4. Describe features distributed shared memory and file system.
5. List and describe load balancing mechanisms in distributed systems.

UNIT – I

Introduction to distributed systems: Fundamentals: -What is Distributed Computing Systems? Distributed Computing System Models, what is DOS? Issues in designing a DOS.

Remote Procedure Calls: The RPC model, Transparency of RPC, Implementing RPC mechanism, Stub generation, RPC messages, Marshaling Arguments and results. Server management, Parameter passing semantics, call semantics, communication protocols RPC's. Complicated RPCs,Client –server binding, Exception handling, Security. Synchronization in distributed Systems: Clock synchronization – logical clocks – physical clocks – clock synchronization

algorithms, Mutual exclusion – A centralized algorithm – A distributed algorithm – a token ring algorithm, Comparison of the three algorithms, Election algorithms – the Bully algorithm – ring algorithm.

15 Hours

UNIT – II

Synchronization in distributed Systems: Dead locks in distributed systems – distributed deadlock avoidance algorithms – distributed deadlock prevention algorithms, distributed deadlock detection algorithms: Centralized approach, Hierarchical approach and Fully distributed approach.

Process Migration: Desirable Features of a Good Migration Mechanism, Process Migration Mechanisms, Threads: Introduction, Motivation for using Threads, Models for Organizing Threads, Issues in Designing Threads Package, Implementing Thread Package. Distributed Shared Memory: General structure, Design and implementation issues of DSM, Granularity, Structure of shared memory space, Consistency Models, Replacement Strategy, Thrashing.

15 Hours

UNIT – III

Distributed File Systems: Desirable features of a good distributed file system, file models, file accessing models, file sharing semantics, file Replication. Resource Management: Desirable features, task management approach, load balancing approach, load sharing approach. Naming: Introduction, Desirable Features of Good Naming System, System-Oriented Names, Object-Location Mechanism, Human Oriented Names, Name Cache.

9 Hours

Course Outcomes:

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

1. Determine the benefits and issues involved in designing distributed systems.
2. Explain various synchronization methods of distributed methods.
3. Compare various process migration approaches and distributed deadlock management approaches.
4. Apply features of distributed shared memory and file system.
5. Describe load balancing mechanisms in distributed systems.

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

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

TEXTBOOK:

1. Pradeep K Sinha," Distributed Operating Systems, Concepts & Design", PHI,2009.

REFERENCE BOOKS:

1. Lampson (Ed), Distributed Systems, Singer – Verlay NY 1981.
2. Mukesh Singhal, Niranjan G,"Advanced Concepts in Operating Systems", Tata McGraw-Hill Education, 2001.
3. E-Books / Online Resources:
4. http://www.gecg.in/papers/ds5thedn.pdf
5. http://cs-www.cs.yale.edu/homes/aspnes/classes/465/notes.pdf

MOOCs:

1. nptel.ac.in/courses/117102060/
2. https://www.coursera.org/learn/distributedsystem.

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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

DIGITAL SIGNAL PROCESSING					
Course Code	:	20CSE62	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:

Describe the behavior of discrete time systems in time& frequency domain.

Explain and Analyze the FFT algorithms.

Analyze the discrete time systems

Explain the features of TMS319C25 and TMS32067 processors.

Apply the numbering system for problem solving in signal processing.

UNIT – I

THE DISCRETE FOURIER TRANSFORM: ITS PROPERTIES AND APPLICATIONS:

Frequency Domain Sampling: The Discrete Fourier Transform: Frequency Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform (DFT), The DFT as a Linear Transformation, Relationship of the DFT to other Transforms. Properties of the DFT: Periodicity, Linearity and Symmetry Properties, Multiplication of Two DFT's and Circular Convolution, Additional DFT Properties. Linear Filtering Methods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences. Frequency Analysis of Signals using the DFT. Efficient Computation of the DFT: FFT Algorithms: Direct Computation of the DFT, Divide-and-Conquer Approach to Computation of the DFT, Radix-2 FFT Algorithms, Radix-4 FFT Algorithms, Split-Radix FFT Algorithms, Implementation of FFT Algorithms. Applications of FFT Algorithms: Efficient computation of the DFT of Two Real Sequences, Efficient computation of the DFT of a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear filtering and Correlation.

15 Hours

UNIT – II

Efficient Computation of the DFT: A Linear filtering approach to Computation of the DFT: The Goertzel Algorithm, The Chirp-Z Transform Algorithm. Quantization Effects in the Computation of the DFT: Quantization Errors in the Direct Computation of the DFT, Quantization Errors in FFT Algorithms. Implementation of Discrete-Time Systems: Structures for the Realization of Discrete-Time Systems. Structures for FIR Systems: Direct-Form Structures, Cascade-Form Structures, Frequency-Sampling Structures, Lattice Structure. Structures for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed. Structures, Cascade-Form Structures, Parallel-Form Structures, Lattice and Lattice-Ladder Structures for IIR Systems. State-Space System Analysis and Structures: State-Space Descriptions of Systems Characterized by Difference Equations, Solution of the State Space Equations, Relationships between Input-Output and State-Space Descriptions, State-Space Analysis in the Z-Domain, Additional State Space Structures.

15 Hours

UNIT – III

Representation of Numbers: Fixed-Point Representation of Numbers, Binary Floating-Point Representation of Numbers, Errors Resulting from Rounding and Truncation. Quantization of Filter Coefficients: Analysis of Sensitivity to Quantization of Filter Coefficients, Quantization of Coefficients in FIR Filters. Round-Off Effects in Digital Filters: Limit-Cycle Oscillations in Recursive Systems, scaling to Prevent Overflow, Statistical Characterization of Quantization effects in Fixed-Point Realizations of Digital Filters, Digital Signal Processors: Architecture, features and instructions of Fixed and Floating Point Processors. (TMS319C25 and TMS32067).

9 Hours

Course Outcomes:

After studying this subject, the student should be able to:

1. Analyze the behavior of discrete-time systems in time & frequency domain.
2. Analyze and implement FFT algorithms.
3. Relate theoretical concepts to practical applications.
4. Summarize the working of TMS319C25 and TMS32067 processors.
5. Apply the numbering system for problem solving in signal processing.

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	3											3	2	
CO2	3	3											3	2	
CO3	3	3	3										3	2	
CO4	3	3											3	2	
CO5	3	3											3	2	

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

TEXTBOOKS:

1. John G. Proakis and Dimitris G. Manolakis , "Digital Signal Processing", PHI, Third Edition 2003.
2. McLellan, Schafer and Yoder, "Signal Processing",Pearson, 2003.
3. RulphChassaing , "Digital signal Processing with C and TMS 319C30", John Wiley,First Edition,1992.

REFERENCE BOOKS:

1. Paulo S. R. Diniz, Eduardo A. B. da Silva And Sergio L. Netto , "Digital Signal Processing System Analysis and Design", Cambridge University Press, 2002.
2. Sanjit K. Mitra , "Digital Signal Processing:A Computer Based Approach" , Tata Mcgraw-Hill Edition 2001.
3. Steven W. Smith, "The Scientist and Engineers Guide to Digital Signal Processing ", Second Edition, California Technical Publishing 1999.
4. Texas Instruments DSP Processors (320 family) data hand book,1988.
5. Jeff Bier, Amit Shoham and Edward A Lec, S.Chand ,"DSP Processor Fundamentals Phil Lapsley", Delhi – 2000.

E-Books / Online Resources:

1. https://lecturenotes.in/subject/44/digital-signal-processing-dsp

MOOCs:

http://nptel.ac.in/courses/117102060/

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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ADVANCED COMPUTER NETWORKS					
Course Code	:	20CSE63		**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. Describe the 802.11 Wireless LANs and cellular internet access.
2. Explain the Mobile IP and mobility management principles in cellular networks and its impact on higher layer protocols.
3. Describe the network support for multimedia, streaming stored video,Voice-over-IP and protocols for real-time conversational applications.
4. Explain the principles of cryptography, digital signatures, end point authentication, secure e-mail and TCP connections.
5. Describe the IPsec, virtual private networks, security of Wireless LANs, firewalls and intrusion detection systems.

UNIT – I

Wireless and Mobile Networks:

Introduction, Wireless links and network characteristics, WiFi:802.11 Wireless LANs, Cellular Internet Access, Mobiltiy Management: Principles, Mobile IP, Managing Mobility in Cellular Networks, Wireless and Mobility: Impact on Higher-Layer Protocols. (Text Book1 Chapter 6

15 Hours

UNIT – II

Multimedia and Networking:

Multimedia Networking Applications, Streaming stored video, Voice-over-IP, Protocols for Real-Time Conversational Applications, Network support for Multimedia. (Text Book-1: Chapter 7)

15 Hours

UNIT – III

Security in Computer Networks:

What is network security?,Principles of cryptography,Message Integrity and

Digital Signatures, End-point Authentication, Securing E-mail, Securing TCP Connections:SSL, Network Layer Security: IPsec and Virtual Private Networks,Securing Wireless LANs, Operational Security: Firewalls and Intrusion Detection Systems.(Text Book-1: Chapter 8)

9 Hours

Course Outcomes:

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

1. Describe and analyze the 802.11 Wireless LANs and cellular internet access.
2. Explain the Mobile IP and mobility management principles in cellular networks and its impact on higher layer protocols
3. Express, Analyze and Evaluate the opportunities and challenges in multimedia data over the network. Apply best protocols and methods towards real problems in multimedia processing.
4. Describe the principles of cryptography, digital signatures, end point authentication, secure e-mail and TCP connections. Identify the necessity cryptography during the transmission of data over the network.
5. Describe the IPsec, virtual private networks, security of Wireless LANs, firewalls and intrusion detection systems. Identify the necessity, opportunities and challenges in protecting the data during transmission over the network.

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	3											3	1	
CO2	3	3											3	1	
CO3	3	3											3	1	
CO4	3	3											3	1	
CO5	3	3											3	1	

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

TEXTBOOK:

James F. Kurose and Keith W. Ross, "Computer Networking- A Top-Down Approach Featuring the Internet", Sixth Edition, Pearson Education,2017.

REFERENCE BOOKS:

1. Manvi, Sunilkumar S,Wireless and Mobile Networks, Concepts and Protocols, Second Edition, Wiley india Pvt. Ltd,2016.
2. Fred Halsall, Multimedia Communications Applications Networks Protocols and Standards, First Edition, Pearson India,2015.
3. William Stallings, Cryptography and Network Security: Principles and Practice, Seventh Edition,2017.

E-Books / Online Resources:

http://etutorials.org
https://www.net.t-labs.tu berlin.de/teaching/computer networking/

MOOCs:

https://swayam.gov.in/explorer?category=NPTEL_Domain
https://www.coursera.org/browse/information-technology/networking
https://www.udemy.com/topic/computer-network/

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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CYBER SECURITY					
Course Code	:	**20CSE64**		**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 fundamental concepts of cyber security and the attacker techniques and impact.
2. Understand the behavior, types and the impact of malicious code on to the cyber system and the techniques used by the hackers.
3. Understand the various defensive tools and policies need to be followed.

UNIT – I

INTRODUCTION TO COMPUTER SECURITY:

Introduction, How Seriously Should You Take Threats to Network Security, Identifying Types of Threats - Malware, Compromising System Security, Denial of Service Attacks, Web Attacks, Session Hijacking, DNS Poisoning; Assessing the Likelihood of an Attack on Your Network, Basic Security Terminology - Hacker Slang, Professional Terms; Concepts and Approaches, How Do Legal Issues Impact Network Security? Online Security Resources – CERT, Microsoft Security Advisor, F-Secure, SANS Institute.

CYBER STALKING, FRAUD, AND ABUSE:

Introduction, How Internet Fraud Works - Investment Offers, Auction Frauds; Identity Theft – Phishing; Cyber Stalking - Laws about Internet Fraud; Protecting Yourself against Cyber Crime - Protecting against Investment Fraud, Protecting against Identity Theft, Secure Browser Settings.

DENIAL OF SERVICE ATTACKS:

Introduction, Denial of Service, illustrating an Attack - Common Tools Used for DoS, DoS Weaknesses, Specific DoS attacks, Land Attack, Distributed Denial of Service (DDoS).

15 Hours

UNIT – II

MALWARE:

Introduction, Viruses - How a Virus Spreads, Recent Virus Examples, W32/Netsky-P, Troj/Invo-Zip, MacDefender, The Sobig Virus, The Mimail Virus, The Bagle Virus, A Nonvirus Virus, Rules for Avoiding Viruses; Trojan Horses, The Buffer-Overflow Attack, The Sasser Virus/Buffer Overflow, Spyware - Legal Uses of Spyware, How Is Spyware Delivered to a Target System? Obtaining Spyware Software;

Other Forms of Malware – Rootkit, Malicious Web-Based Code, Logic Bombs, Spam; Detecting and Eliminating Viruses and Spyware - Antivirus Software, Antispyware Software.

TECHNIQUES USED BY HACKERS:

Introduction, Basic Terminology, The Reconnaissance Phase - Passive Scanning Techniques, Active Scanning Techniques; Actual Attacks - SQL Script Injection, Cross-Site Scripting, Password Cracking.

INDUSTRIAL ESPIONAGE IN CYBERSPACE:

Introduction, What Is Industrial Espionage? Information as an Asset, Real-World Examples of Industrial Espionage - Example 1: VIA Technology, Example 2: General Motors, Example 3: Interactive Television Technologies, Inc, Example 4: Bloomberg, Inc, Example 5: Avant Software, Industrial Espionage and You; How Does Espionage Occur? - Low-Tech Industrial Espionage, Spyware Used in Industrial Espionage, Steganography Used in Industrial Espionage; Phone Taps and Bugs, Protecting against Industrial Espionage, Industrial Espionage Act, Spear Phishing.

15 Hours

UNIT – III

COMPUTER SECURITY SOFTWARE:

Introduction, Virus Scanners - How Does a Virus Scanner Work? Virus-Scanning Techniques, Commercial Antivirus Software; Firewalls - Benefits and Limitation of Firewalls, Firewall Types and Components, How Firewalls Examine Packets, Firewall Configurations, Commercial and Free Firewall Products, Firewall Logs; Antispyware, Intrusion-Detection Software - IDS Categorization, IDS Approaches, Snort, Honey Pots, Other Pre-emptive Techniques.

SECURITY POLICIES:

Introduction, What Is a Policy, Defining User Policies – Passwords, Internet Use, Email Usage, Installing/Uninstalling Software, Instant Messaging, Desktop Configuration, Final Thoughts on User Policies; Defining System Administration Policies - New Employees, Departing Employees, Change Requests, Security Breaches, Virus Infection, Denial of Service Attacks, Intrusion by a Hacker; Defining Access Control, Developmental Policies, Standards, Guidelines, and Procedures.

9 Hours

Course Outcomes:

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

1. Discuss the various threats approaches on the cyber system.
2. Interpret the threat impact on the cyber system.
3. Identify the nature and varying structures of the malicious code and the techniques used by the hackers that is harm to the security.
4. Recognize the defense tools available to protect the cyber systems.
5. Interpret the associated security policies need to be followed.

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

Table: Mapping Levels of COs to POs / PSOs

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

TEXTBOOK:

Chuck Easttom, "Computer Security Fundamentals", Pearson publication, second edition.

REFERENCE BOOKS:

1. William Stalling, "Cryptography and Network Security: Principles and Practice", Sixth edition, Pearson Education.

2. Karen Scarfone, Peter Mell"Guide to Intrusion Detection and Prevention Systems (IDPS)", NIST special publication 800-94.

3. Cyber Security –Nina godbole, SunitBelapure, Publication: John Wiley, 2012.

4. Allan Friedman and P. W. Singer, "Cybersecurity and Cyberwar: What Everyone Needs to Know", Oxford University Press, published in 2013.

5. Yuri Diogenes, ErdalOzkaya, "Cybersecurity - Attack and Defense Strategies: Infrastructure security with Red Team and Blue Team tactics (Kindle Edition)", published by Packt publishing ltd. 2018.

6. Don Franke, "Cyber Security Basics: Protect Your Organization by Applying the Fundamentals", CreateSpace Independent Publishing Platform, 2016.

7. Joseph Steinberg, "Cybersecurity for Dummies", John Wiley & Sons, 2019.

8. RaefMeeuwisse, "Cybersecurity for Beginners", Cyber Simplicity, 2017.

9. Amelia Phillips, Bill Nelson, and Christopher Steuart, "Guide to Computer Forensics and Investigations", Cengage Learning, 2009, fourth edition.

10. Scott Augenbaum, "The Secret to Cybersecurity: A Simple Plan to Protect Your Family and Business from Cybercrime", publisher-Simon and Schuster, 2019.

E-BOOKS / ONLINE RESOURCES:

1. https://heimdalsecurity.com/pdf/cyber_security_for_beginners_ebook.pdf

2. http://larose.staff.ub.ac.id/files/2011/12/Cyber-Criminology-Exploring-Internet-Crimes-and-Criminal-Behavior.pdf

3. http://docshare04.docshare.tips/files/21900/219006870.pdf

4. http://www.uou.ac.in/sites/default/files/slm/FCS.pdf

5. https://cyber-cops.com/book_detail

6. https://www.sans.org/security-resources/

7. https://www.springboard.com/blog/free-cybersecurity-resources/

8. https://www.eccouncil.org/free-cybersecurity-resources/

9. http://nptel.ac.in/courses/106105031/40

10. http://nptel.ac.in/courses/106105031/39

11. http://nptel.ac.in/courses/106105031/38

MOOCs:

1. www.coursera.org/course/inforisk
2. https://www.cyberdegrees.org/resources/free-online-courses/
3. https://swayam.gov.in/nd2_cec20_cs15/preview
4. https://www.classcentral.com/course/swayam-cyber-security-13978
5. https://www.futurelearn.com/courses/introduction-to-cyber-security
6. https://www.my-mooc.com/en/categorie/cybersecurity

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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ARTIFICIAL INTELLIGENCE						
Course Code	:	**20CSE71**		**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. Analyze the most fundamental knowledge to the students so that they can understand what the AI is.
2. Gain a historical perspective of AI and its foundations
3. Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4. Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool.
5. Explore the current scope, potential, limitations, and implications of intelligent systems.

UNIT – I

INTRODUCTION: INTELLIGENT AGENTS

What is AI? Foundation of AI, State of Art, Agents of Environment, Structure of agents. (Textbook-1: Chapter 1: 1.1 to 1.4 and 2.1 to 2.4)
PROBLEM SOLVING:
Problem solving agents, Example Problems, searching for solutions, Uniformed and Informed search strategies, Heuristic Functions
 (Textbook-1: Chapter 3: 3.1, 3.6),

15 Hours

UNIT – II

UNCERTIAN KNOWLEDGE AND REASONING:

Acting under uncertainty, Basic Probability Notation, Inference using full joint distributions, Bayes Rule and its use.
(Textbook-1: Chapter 13: 13.1, 13.5)
PROBABILISTIC REASONING OVER TIME:
Time uncertainty, Temporal Models, Hidden Markov Models.
(Textbook-1: Chapter 15: 15.1, 15.3)

15 Hours

UNIT – III

REINFORCEMENT LEARNING:

Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Applications of Reinforcement Learning.
(Textbook-1: Chapter 21: 21.1 to 21.6)

9 Hours

Course Outcomes:

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

1. Explain the fundamental understanding of the history of artificial intelligence (AI) and its foundation.
2. Interpret the basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
3. Describe the awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4. Identify and explain the proficiency developing applications in an 'AI language', expert system shell, or data mining tool.
5. Determine an ability to share in discussions of AI, its current scope and limitations, and societal implications.

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOK:

Stuart Russel and Peter Nerving, "Artificial Intelligence A Modern Approach", Pearson 3rd Edition, 2016

REFERENCE BOOKS:

1. DAN W PATTERSON," Introduction to Artificial Intelligence and Expert Systems", PEARSON, 1st edition 2015.
2. Tom. M. Mitche, "Machine Learning", McGraw Higher Ed, 1st edition 2013.
3. Elaine Rich, "Artificial Intelligence", Mc Graw Hill 3rd Edition, 2017.
4. Er. Rajiv Chopra, "Artificial Intelligence – A practical approach", Chand publication, 1st edition 2012

MOOCs:

1. Artificial Intelligence -http://www.nptelvideos.in/2012/11/artificial-intelligence.html
2. http://nptel.ac.in/courses/106105077/
3. https://www.edx.org/course/artificial-intelligence-ai-columbiax-csmm-101x-4
4. https://www.udemy.com/artificial-intelligence

E-books:

Practical Artificial Intelligence Programming with Java, Third Edition, Mark Watson

SEE SCHEME:

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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PATTERN RECOGNITION					
Course Code	:	20CSE72		**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. Explain the concepts Machine Perception, Pattern Recognition, Design cycle, learning and Bayesian Decision Theory2
2. Explain the concepts Machine Perception, Pattern Recognition, Design cycle, learning and Bayesian Decision Theory
3. Perform likelihood estimation, parameter estimation and complex analysis, Demonstrate nearest neighbour rule, metrics and nearest-neighbour classification and fuzzy classification
4. Explain the linear discriminant functions, Perceptron criterion function and squared-error procedures
5. Apply the principles of Learning, clustering, component analysis and multidimensional scaling.

UNIT – I

Introduction: Machine Perception, Pattern Recognition systems, Design cycle, learning and adaptation (1.1, 1.3, 1.4, 1.5 of Ref.1) Bayesian Decision Theory: Introduction, Bayesian Decision theory – continuous features, classifiers, discriminant functions, and decision surfaces, normal density and discriminant functions, Bayes decision theory – discrete features (2.1, 2.2, 2.4, 2.5, 2.6, 2.9 of Ref. 1). Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood estimation, Bayesian Estimation, Bayesian parameter estimation, problem of dimensionality, sufficient and exponential family, complex analysis & discriminants, (3.1 to 3.8 of Ref.1).

15 Hours

UNIT – II

Nonparametric Techniques: Introduction, Density Estimation, Parzen Windows, k-nearest neighbour estimation, nearest neighbour rule, metrics and nearest-neighbour classification, fuzzy classification, reduced coulomb energy, approximations by series expansions (4.1 – 4.9 of Ref.1) Linear discriminant functions: Introduction, linear discriminant functions, generalized linear discriminant functions, minimizing the Perceptron criterion function, relaxation procedures, non-separable behaviours, minimum squared-error procedures, Ho-Kashyap procedures (5.1 to 5.9 of Ref.1).

15 Hours

UNIT – III

Unsupervised learning and clustering: Mixture densities and identifiability, maximum-likelihood estimates, application to normal mixtures, unsupervised Bayesian learning, data decryption and clustering, criterion functions and clustering, hierarchical clustering, on-line clustering. Component analysis, low-dimensional representations and multidimensional scaling (10.1 to 10.14 except 10.8, 10.12 of Ref. 1) Syntactic pattern Recognition: Overview, qualifying structure in pattern description and recognition, grammar-based approach, elements of formal grammar (Chap. 3 of Ref. 2)

9 Hours

Course Outcomes:

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

1. Recall the basics of pattern recognition systems and Bayesian Decision Theory.
2. Determine the maximum likelihood and Bayesian parameter estimation.
3. Express the nonparametric techniques such as density estimation and nearest neighbour estimation.
4. Examine linear discriminant functions, minimizing the perception criterion function and minimum squared-error procedures
5. Describe the various unsupervised learning and clustering methods.

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	3											3		
CO2	3	3											3		
CO3	3	3											3		
CO4	3	3	2										3	2	
CO5	3	3	2										3	2	

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

TEXTBOOKS :

1. Richard O. Duda, Peter E. Hart and David G Stork," Pattern Classification", John Wiley & Sons, Inc.2nd Ed. 2001.
2. Robert Schalkoff, "Pattern Recognition: Statistical, Structural and Neural Approaches", John Wiley & Sons, Inc.1992.

REFRENCE BOOKS:

1. Christopher M. Bishop, "Pattern recognition and machine learning (information science and statistics)." Springer -Verlag New York Inc,2006.
2. Anzai, Yuichiro,"Pattern recognition and machine learning", Elsevier, 2012.

E-Books / Online Resources:

http://www.37steps.com/data/pdf/PRIntro_medium.pdf

MOOCs:

https://www.mooc-list.com/tags/pattern-recognition
http://nptel.ac.in/courses/117105101/

SEE SCHEME:

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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SOCIAL AND WEB ANALYTICS

Course Code	:	20CSE73		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 social media, web and social media analytics, and their potential impact.
2. Determine how to Leverage social media for better services and Understand usability metrics, web and social media metrics
3. Use various data sources and collect data relating to the metrics and key performance indicators
4. Identify key performance indicators for a given goal, identify data relating to the metrics and key performance indicators
5. Use ready-made web analytics tools (Google Analytics) and be able to understand a statistical programming language (R), also use its graphical development environment (Deduce) for data exploration and analysis.

UNIT – I

Introduction to web and social analytics: Overview of web & social media (Web sites, web apps, mobile apps and social media), Impact of social media on business, Social media environment, , How to leverage social media for better services, Usability, user experience, customer experience, customer sentiments, web marketing, conversion rates, ROI, brand reputation, competitive advantages.

Need of using analytics, Web analytics technical requirements., current analytics platforms, Open Source vs licensed platform, choosing right specifications & optimal solution, Web analytics and a Web analytics 2.0 framework (clickstream, multiple outcomes Relevant Data And its Collection using statistical Programming language R.:Data (Structured data, unstructured data, metadata, Big Data and Linked Data), Participating with people centric approach, Data analysis basics (types of data, metrics and data, descriptive statistics, comparing, Basic overview of R:R-Data Types, R-Decision Making, R-Loops, R-functions, R-Strings, Arrays, R-Lists, R-Data Frame, R-CSV Files, R-Pie Charts, R-Bar charts, R-Barplots. Basic Text Mining in R and word cloud.

15 Hours

UNIT – II

Kpi/Metrics: Understand the discipline of social analytics, Aligning social objectives with business goals, Identify common social business objectives, developing KPIs; Standard vs Critical metrics. PULSE metrics (Page views, Uptime, Latency, Seven-day active users) on business and technical Issues, HEART metrics (Happiness, Engagement, Adoption, Retention, and Task success) on user behaviour issues; Bounce rate, exit rate, conversion rate, engagement, strategically aligned KPIs, Measuring Macro & micro conversions, On-site web analytics, off-site web analytics, the goal-signal-metric process. Case study on Ready-made tools for Web and social media analytics (Key Google Analytics metrics, dashboard, social reports, Tableau Public and KNIME

Mining Twitter: Exploring Trending Topics, Discovering What People Are Talking About, and More: Why Is Twitter All the Rage?, Exploring Twitter's API, Fundamental Twitter Terminology, Creating a Twitter API Connection, Exploring Trending Topics, Searching for Tweets, Analyzing the 140 Character, Extracting Tweet Entities, Analyzing Tweets and Tweet Entities with Frequency Analysis,

Computing the Lexical Diversity of Tweets, Examining Patterns in Retweets, Visualizing Frequency Data with Histograms.

Mining Facebook: Analysing Fan Pages, Examining Friendships, and More: Overview, Exploring Facebook's Social Graph API, Understanding the Social Graph API, Understanding the Open Graph Protocol, Analyzing Social Graph Connections, Analyzing Facebook Pages, Examining Friendships.

15 Hours

UNIT – III

Data Mining in Social Media :Introduction, Data Mining in a Nutshell, Social Media, Motivations for Data Mining in Social Media, Data Mining Methods for Social Media, Data Representation, Data Mining - A Process, Social Networking Sites: Illustrative Examples, The Blogosphere: Illustrative Examples, Related Efforts, Ethnography and Netnography, Event Maps

Text Mining in Social Networks

Introduction, Keyword Search, Query Semantics and Answer Ranking, Keyword search over XML and relational data, Keyword search over graph data, Classification Algorithms, Clustering Algorithms, Transfer Learning in Heterogeneous Networks

9 Hours

Course Outcomes:

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

1. Understand social media, web and social media analytics, and their potential impact.
2. Identify and explain ready-made web analytics tools (Google Analytics) and able to understand a statistical programming language (R).
3. Identify key performance indicators for a given goal, identify data relating to the metrics and key performance indicators.
4. Determine how twitter mining can be done for better services.
5. Explain text mining and data mining in social networks.

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOKS:

1. Matthew A. Russell," Mining of Social web, O'Reilly", Second Edition ,ISBN-13: 978-1449367619, 2013,
2. Charu C Agarwal, "Social Network Data Analytics", Springer; October 2014.

REFERENCE BOOKS:

1. Hand, Mannila, and Smyth,"Principles of Data Mining", Cambridge, MA: MIT Press, ISBN: 026208290X, 2001.
2. Avinash Kaushik, "Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity", John Wiley &Sons; Pap/Cdr Edition, 2009.
3. Tom Tullis, Bill Albert, "Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics", First Edition, Morgan Kaufmann ,2008.
4. Jim Sterne, Social Media Metrics: "How to Measure and Optimize Your Marketing Investment", John Wiley & Sons ,2010.
5. Brian Clifton, "Advanced Web Metrics with Google Analytics", Third Edition, John Wiley & Sons ,2012.

E-Books / Online Resources:
1. http://www.webpages.uidaho.edu/~stevel/504/Mining-the-Social-Web-2nd-Edition.pdf
2. http://dbmanagement.info/Books/MIX/Computer_Science_Mit_Press_Principles_Of_Data_Mining_Big_Data.pdf

MOOCs:
1. Stanford: http://library.stanford.edu/projects/r
2. http://nptel.ac.in/courses/106106146/21#watch
3. https://www.coursera.org/learn/social-media-data-analytics

SEE SCHEME:
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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NEURAL NETWORKS AND DEEP LEARNING				
Course Code	:	**20CSE74**	**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:

Explain the importance and basics of deep learning

Outline the structure of neural network and the process of training in neural networks

Describe the structure and working of convolution neural networks.

UNIT – I

Introduction: What is Deep Learning? What are Neural Networks? Neural networks basics: cost functions, hypotheses and tasks; training data; maximum

likelihood-based cost, cross entropy, MSE cost; feed-forwardnetworks; MLP, sigmoid units; neuroscience inspiration;

15 Hours

UNIT – II

Neural Networks Training:Learning in neural network: output vs hidden layers; linear vs nonlinear networks; Back propagation: learning via gradient descent; recursive chain rule (backpropagation); if time: bias-variance tradeoff, regularization; output units: linear, softmax; hidden units: tanh, RELU; Deep learning strategies: GPU training, regularization, RLUs, dropout.

Convolution Neural Networks: Invariance, stability, Variability models (deformation model, stochastic model), Scattering networks, Group Formalism, Properties of CNN representations: invertibility, stability, invariance.

15 Hours

UNIT – III

Covariance/invariance: capsules and related models, Connections with other models: dictionary learning, LISTA, localization, regression, Embeddings (DrLim), inverse problems, Extensions to non-Euclidean domains.

Deep Neural Networks for Sequences: Recurrent Neural Networks: RNN for language modelling and other tasks

9 Hours

Course Outcomes:

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

1. Demonstrate the importance and basic of deep learning.

2. Illustrate the various training methods of neural network.

3. Explain the concept of convolution and apply this for neural network design.

4. Explore and develop neural network models

5. Apply Convolution neural networks and recurrent neural networks for real world Problems

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOK:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville , "Deep Learning",Cambridge: MIT press, 2016.

REFERENCE BOOKS:

1. Duda, R.O., Hart, P.E., and Stork, D.G.,"Pattern Classification", Wiley-Interscience. Second Edition. 2001.
2. Theodoridis, S. and Koutroumbas, K.,"PatternRecognition",Fourth Edition, Academic Press, 2008.
3. Russell, S. and Norvig, N, Artificial Intelligence: "A Modern Approach", Prentice Hall Series in ArtificialIntelligence. 2003.
4. Bishop, C. M.,"Neural Networks for Pattern Recognition", Oxford University Press. 1995.
5. Hastie, T., Tibshirani, R. and Friedman, J,"The Elements of Statistical Learning", Springer. 2001.

E-Books / Online Resources:

1. http://cs224d.stanford.edu/syllabus.html
2. https://www.cs.colorado.edu/~mozer/Teaching/syllabi/DeepLearningFall2017/

MOOCs:

1. https://www.class-central.com/course/kadenze-creative-applications-of-deep-learning-with-tensorflow-6679
2. https://www.class-central.com/course/practical-deep-learning-for-coders-part-1-7887

SEE SCHEME:

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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BUSINESS INTELLIGENCE					
Course Code	:	20CSE75	**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. Identify various sources of data and identify the methods to process them.
2. Explain the ETL process and carryout the ETL process for a given data set.
3. Design a suitable schema for a given problem.
4. Illustrate the concepts of data mining.
5. Demonstrate the Classification and clustering methods.

UNIT – I

INTRODUCTION TO BUSINESS INTELLIGENCE:

Types of digital data – Structured, semi structured and unstructured – sources, characterises, challenges; Introduction to OLTP, OLAP and Data Mining; BI Definitions & Concepts; BI Framework, Who is BI for, BI Users, BI Applications;BI Roles & Responsibilities,

Need for data warehouse – definition, data mart, Approaches for data warehouse, ETL, Basics of Data Integration – approaches, advantages.
Text Book 1 Chapter [2.3-2.5] [(3.1-3.5), (3.8)] [5.1-5.5] [(6.1-6.3), (6.5-6.10)]

15 Hours

UNIT – II

Introduction to data quality, data profiling, Multidimensional data modelling – Basics, types of data model, Concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema; Dimension model life cycle.

Measure, metrics, KPIs and performance management, salient attributes of a good metric, SMART test.

Introduction to enterprise reporting – perspectives, standardization and presentation, balanced scorecards. Concepts of dashboards- types, steps.
Text Book 1 Chapter [6.10-6.12] [7.2-7.8] [(8.2-8.3)] [((9.1-9.2) (9.4-9.7)]

15 Hours

UNIT – III

Data Mining—On What Kind of Data? Data Mining Functionalities—What Kinds of Patterns Can Be Mined? Mining Association rules: Basic concepts, frequent item set mining methods - Apriori Algorithm, Generating Association Rules from Frequent Item sets.
Text Book 2: Chapter [1.1-1.4][6.1-6.2(6.2.1-6.2.4)]

9 Hours

Course Outcomes:

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

1. Identify the sources of data based on its type for a business application and apply OLTP, OLAP operations. (L3)
2. Apply the knowledge of BI operation to determine various roles in a BI application and design the ETL process for handling the data from a given application. (L3)
3. Relate the data warehousing concepts for a real time business application to model a star, snowflake schema for a multi-dimensional data of a given problem. (L3)
4. Explain data quality and profiling methods, identify the quality of the data using data profiling techniques. Apply the measures and metrics to the data to design an enterprise report. (L3)
5. Apply the concepts of mathematics and computer algorithm to illustrate the data mining concepts using association rules. (L2)

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							1	1		1	1	3	
CO2	1	2	3						1	1		1		3	
CO3	1	2	3						1	1		1		3	
CO4	1	2	2						1	1		1		3	2
CO5	2	3							1	1		1	3	3	

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

TEXTBOOKS:

1. R N Prasad and Seema Acharya, "Fundamentals of Business Analytics", Wiley-India, 2011
2. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques",
3. Morgan Kaufmann Publishers, (ISBN: 1-55860-489-8), 2000.
4. David Loshin, "Business Intelligence -The Savvy Manager's Guide", Morgan Kaufmann Publishers,2003.

REFERENCE BOOKS:

1. Carlo Vercellis "Business Intelligence-Datamining and Optimization for Decision Making",Wiley,2009
2. Uddagiri Chandrasekhar S.K. Shinde,"Data Mining and Business Intelligence", Dreamtech Press,2015.

E-Books / Online Resources:

1. https://cdn.ttgtmedia.com/searchDataManagement/downloads/Data_Warehouse_Design.pdf
2. http://download.101com.com/tdwi/ww24/WhatWorks24DigitalEdition.pdf

MOOCs:

1. http://nptel.ac.in/courses/110104086/13
2. https://freevideolectures.com/course/3635/microsoft-business-intelligence

SEE SCHEME:

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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BIG DATA ANALYTICS					
Course Code	:	**20CSE81**	**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. Study and comprehend in depth the fundamental issues behind Big Data problem.
2. Understand various Big Data technologies, different databases and Hadoop Components.
3. Learn various NoSQL systems and Compare NoSQL systems with other and relational systems.
4. Determine various techniques for analyzing the data such as Pig and Hive.
5. Study and Relate Different Analytics associated with Big Data problem.

UNIT – I

Chapter 1: What Is Big Data and Why Is It Important? Challenges of Big Data. The Evolution of Data Management, Understanding the Waves of Managing Data, creating manageable data structures, Web and content management, Managing

big data. Defining Big Data, building a Successful Big Data Management Architecture, beginning with capture, organize, integrate, analyze, and act, Setting the architectural foundation, Performance matters, Traditional and advanced analytics.

Chapter 2: Examining Big Data Types and its Sources.

Defining Structured Data Exploring sources of big structured data, Understanding the role of relational databases in big data Defining Unstructured Data, exploring sources of unstructured data, Understanding the role of a CMS in big data management. Looking at Real-Time and Non-Real-Time Requirements, Putting Big Data Together, managing different data types, integrating data types into a big data environment.

Chapter 3: Technology Foundations of Big Dat.

Exploring the Big Data Stack: - Layer 0: Redundant Physical Infrastructure - Physical redundant networks, Managing hardware: Storage and servers, Infrastructure operations - Layer 1: Security Infrastructure, Interfaces and Feeds to and from Applications and the Internet- Layer 2: Operational Databases. Layer 3: Organizing Data Services and Tools. Layer 4: Analytical Data Warehouses, Big Data Analytics, Big Data Applications.

(Text Book-1: chapter 1,2,4)

15 Hours

UNIT – II

Chapter 4 : Big Data Management. Introduction to NoSQL, NewSQL

Introduction to NoSQL, Uses, Features and Types, Need, Advantages, Disadvantages and Application of NoSQL, Overview of NewSQL. RDBMSs Are Important in a Big Data Environment. PostgreSQL relational database. Nonrelational Databases. Key-Value Pair Databases - Riak key-value database. Document Databases MongoDB, CouchDB . Columnar Databases, HBase columnar database. Graph Databases- Neo4J graph database.

Chapter 5 : MapReduce Fundamentals

Tracing the Origins of MapReduce. Understanding the map Function, Adding the reduce Function Putting map and reduce together.

(Text Book-1: Chapter 7,8)

15 Hours

UNIT – III

Chapter 6 : Hadoop Eco System and Analytics of Big data.
Explaining Hadoop, Understanding the Hadoop Distributed File System (HDFS) NameNodes. Data nodes, Under the covers of HDFS. Hadoop MapReduce. Getting the data ready, Let the mapping begin. Reduce and combine. Building a Big Data Foundation with the Hadoop Ecosystem, Managing Resources and Applications with Hadoop YARN, Storing Big Data with HBase, Interacting with Pig and Pig latin, Sqoop, Zookeeper.
Chapter 7: Defining Big Data Analytics.Basic analytics, Advanced analytics, Operationalized analytics, Monetizing analytics. Modifying Business Intelligence Products to Handle Big Data, Studying Big Data Analytics Examples.
(Text Book-1: Chapter 9,10,12)

9 Hours

Course Outcomes:

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

1. Outline the theory of big data, and explain applications of big data.
2. Analyse the technological foundations for Big data with hadoop and design of hadoop distributed file system.
3. Get the idea of NoSQL databases, different types of NoSQL/NewSQL datastores.
4. Understand the concept of MapReduce workflow.
5. Understand the need of Big Data Analytics and Analyze Hadoop Ecosystem.

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

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

TEXTBOOK:

1. Judith Hurtiwz, Alan Nugent, Dr. Fern Halper, Marica Kaufman "Big Data for Dummies" A wiley Brand.

REFERENCE BOOKS:

1. Minelli, Chambers, Dhiray,"Big Data Big Analytics", Wiley,2013.
2. Bart Baesens , "Analytics in a Big Data World", Wiley,2014.
3. Boris Lublinsky, Kevin T. Smith, "Hadoop Solutions", Wrox, First Edition,2013
4. Chuck Lam, "Hadoop in Action", Dreamtech, 2011.
5. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley,2017.
6. Alex Holmes,"Big Data Black Book", Dreamtech, 2015.

E-Books / Online Resources:

ftp://public.dhe.ibm.com/software/pdf/at/SWP10/Big_Data_Analytics.pdf
https://www.wileyindia.com/big-data-analytics-2ed.html

MOOCs:

https://www.coursera.org/specializations/big-data
nptel.ac.in/courses/106104135/48

SEE SCHEME:

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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IMAGE PROCESSING					
Course Code	:	**20CSE82**		**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. Make use of Electromagnetic Spectrum, find the equivalence between pixels.
2. Make use of spatial and frequency domain, smoothing and sharpening filters.
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. Understand different compression model.
5. Tellhow 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. Digital Image Fundamentals - Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels.

Intensity Transformations and Spatial Filtering -Background, Some Basic Intensity Transformation Functions, Histogram Processing-Histogram Equalization, Histogram Matching. Local Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

[Text book chapters 1,2,3]

15 Hours

UNIT – II

Filtering in Frequency Domain – Background, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform (DFT)of Functions of one continuous variable, Image smoothing using Frequency-Domain Filters – Ideal Lowpass Filters, Butterworth Lowpass Filters, Gaussian Lowpass Filters, Image Sharpening using Frequency Domain Filters -Ideal Highpass Filters, Butterworth Highpass Filters, Gaussian Highpass Filters, Homomorphic Filtering.
[Text book chapter 4.1,4.3,4.4,4.8,4.9]
Image Compression – Fundamentals- Coding Redundancy, Spatial and Temporal Redundancy, Image Compression Model. Some Basic Compression Model – Huffman Coding, Arithmetic Coding, LZW coding, Bit-Plane Coding, Run -Length Coding.
[Text book chapter 8.1,8.2]
Morphological Image Processing – Preliminaries, Dilation and Erosion, Opening and Closing, the Hit-or-Miss Transformation, Some Basic Morphological Algorithms -Boundary Extraction, Thinning, Thickening
[Text book chapter 9.1,9.2,9.3,9.4,9.5]

15 Hours

UNIT – III

Image Segmentation – Point, Line and Edge Detection – Background, Detection of Isolated Points, Line Detection, Edge Model, Basic Edge Detection, Edge Linking and Boundary Detection, Thresholding- Foundation, Basic Global Thresholding, Region Based Segmentation Region growing, splitting and merging.
[Text book chapter 10.1,10.2,10.3,10.4]

9 Hours

Course Outcomes:

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

1. Apply the concept of Digital Image Processing and Steps in Digital Image Processing, Able to apply the Knowledge of Image Sampling and Quantization and Illustrate Some Basic Relationships between Pixels using Knowledge of 4-8 and M adjacency.

2. Design and Formulate Histogram processing. Analyze Smoothing Spatial Filters, Sharpening Spatial Filters by applying mathematical knowledge.

3. Explain Frequency domain and illustrate Smoothing Frequency-Domain Filters. Analyze Sharpening Frequency-Domain Filters. Apply and Design Image Compression Standards and models.

4. Analyze the concept of Morphological Image Processing by applying mathematical knowledge.

5. Design and Formulate Image segmentation techniques and prove the properties Region-Based Segmentation.

COs	Table-2: Mapping Levels of COs to POs / PSOs		
COs	\multicolumn{12}{c}{Program Outcomes (POs)}	\multicolumn{3}{c}{PSOs}		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	3										3	2	
CO2		3											3		
CO3	2	3											3		
CO4	2		3										3	2	
CO5		2	3										3	2	2

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

TEXTBOOK:

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education, Third Edition.

REFERENCE BOOKS:

1) Digital Image Processing with Matlab & Labview Vipula Singh Published by Reed Elsevier India Pvt.Ltd | Language - English | Binding - Paper Back.

2) Anil K Jain, "Fundamentals of Digital Image Processing", Prentice-Hall of India Pvt. Ltd., 1997.

3) Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Thomoson Learning, Brooks/Cole, Second Edition. 2001.

4) B.Chanda, D Dutta Majumder, "Digital Image Processing and Analysis", Prentice- Hall, India, 2002.

5) Steven W. Smith, "The Scientist and Engineers Guide to Digital Signal Processing ", California Technical Publishing, Second Edition, 1999.

E-Books / Online Resources:

iitlab.bit.edu.cn/HandbookofImageandVideoProcessing.pdf

http://www.cs.ukzn.ac.za/~sviriri/Books/Image-Processing/book4.pdf

MOOCs:

https://nptel.ac.in/courses/117105079/

https://swayam.gov.in/nd1_noc19_ee55/preview

https://www.coursera.org/learn/image-processing

https://www.coursera.org/learn/image-processing

SEE SCHEME:

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	:	20CSE83	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

Explain the importance of NLP and breaking of words.

Outline the syntax, semantics and pragmatics in speech language.

Describe the models for different applications of NLP.

UNIT – I

Knowledge in speech and language processing; Ambiguity; Models and algorithms; Regular expressions - Basic Regular Expression Pattern, Disjunction, Grouping, and Precedence, A Simple Example, A More Complex Example, Advanced Operators(2.1.1 - 2.1.5), Using an FSA to Recognize Sheep-talk, Formal Languages, Another Example, Non-Deterministic FSAs, Using an NFSA to Accept String(2.2.1 - 2.2.5); Words and Transducers - Inflectional Morphology, Derivational Morphology, Cliticization, Non-concatenative Morphology, Agreement(3.1.1 - 3.1.5); Finite-state morphological parsing(3.2); Detecting and correcting spelling errors, Minimum edit distance(3.10 - 3.11), N-Grams - Counting words in corpora, Simple(un-smoothed) n-grams(4.1 - 4.2); Part – of - Speech Tagging - English word classes, tagsets for English(5.1 - 5.2), Hidden Markov Models - Markov chains, The Hidden Markov Model(6.1 - 6.2).

(Refer Text Book 1)

15 Hours

UNIT – II

Syntactic Parsing: Grammars and syntax structure, A top down parser, Depth first strategy vs Breadth first strategy, Bottom up chart parser, Efficiency considerations, Transition Network Grammars, Top down chart parser.

(Refer Text Book 2)

Representing Meaning: Computational desiderata for representations, Meaning structure of language, Model theoretic semantics, First order logic. (17.1 – 17.4)

Computational Semantics: Syntax driven semantic analysis, Semantic augmentations to context-free grammar rules, Quantifier scope ambiguity and under specification, Unification based approaches to semantic analysis. (18.1 – 18.4)

Applications:Information Extraction - Named entity recognition, Relation detection and classification, Temporal and event processing, Template filling (22.1-22.4).

(Refer Text Book 1)

15 Hours

UNIT – III

Question Answering and Summarization – Information retrieval, Factoid question answering, Summarization, Multi document summarization (23.1 – 23.4); Dialog and Conversational Agents - Properties of human conversations, Basic dialogue systems, VoiceXML (24.1-24.3)   (Refer Text Book 1)

9 Hours

Course Outcomes:

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

1. Explain the understanding of core tasks in NLP.
2. Demonstrate the syntax, semantics and pragmatics in speech language.
3. Implement and experiment the models for different applications of NLP.
4. Demonstrate understanding of state-of-the-art algorithms and techniques for text-based processing of natural language.
5. Demonstrate understanding of human languages and be familiar with the most mainstream descriptive and theoretical frameworks for handling their properties.

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												3	
CO2	1	2	3											3	
CO3	2	3												3	
CO4	1	2	3											3	
CO5	2	3												3	

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

TEXTBOOKS:

1. Jurafsky, D. and J. H. Martin," Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Second Edition, Prentice Hall, 2008.
2. Allen, James, "Natural Language Understanding", Second Edition, Benjamin/Cumming, 1995.

REFERENCE BOOKS:

1. Steven Bird, S., Klein, E., Loper, E, "Natural Language Processing with Python-Analyzing Text with the Natural Language Toolkit", O'Reilly Media, 2010.
2. Grant S Ingersoll, Thomas S. Morton, and Andrew L. Farris, "Taming text: how to `find, organize, and manipulate it" Manning Publications Co., 2013.
3. Feldman Ronen, and James Sanger, "The text mining handbook: advanced approaches in analyzing unstructured data", Cambridge university press,2007.
4. Christopher D Manning, and Hinrich Schütze," Foundations of statistical natural language processing", MIT press, 1999.

E-Books / Online Resources:

1. http://www.allitebooks.in/mastering-natural-language-processing-python/
2. https://github.com/hayderimran7/free-tech-ebooks-from-packtpub/tree/master/Natural%20Language%20Processing%20with%20Java%20and%20LingPipe%19Cookbook

MOOCs:

1. https://www.experfy.com/training/courses/natural-language-processing-for-retail
2. https://www.class-central.com/course/coursera-natural-language-processing-9603

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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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SOFT COMPUTING					
Course Code	:	**20CSE84**		**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. Differentiate hard and soft computing, Define SC constitutes, List Applications, Outline Intelligent systems architecture
2. Design conceptual GA algorithm, Illustrate Mutation and Cross over operations, define learning strategies, List ML applications, Describe the architecture of learning agent
3. Explain the structure and function of Biological Neuron, discuss MFF networks, represent back propagation
4. Demonstrate fuzzy operations, membership function, compare fuzzy models, derive fuzzy rules, outline Fuzzy inference systems
5. Analyse decision making strategies, list expert system features, tools, explain expert's system architecture

UNIT – I

Introduction to Soft Computing:

Evolution of Computing, Soft and Hard Computing, Soft Computing characteristics, Constituents and Applications, AI Definitions and Intelligent systems architecture.

Genetic Algorithms:

Introduction to Genetic Algorithms (GA) – Conceptual GA algorithm, Reproduction operators Mutation and Cross over, Applications of GA, Learning Definitions, strategies, Machine Learning Approach, applications and architecture of learning agent

(Text Book-1:, Chapter 1 .1 to 1.3)(Text Book-3:, Chapter 1)

(Text Book -4; ,Chapter 1 and 2

15 Hours

UNIT – II

NEURAL NETWORKS:

Introduction to Neural Networks, Applications, Structure and function of Biological Neuron, ANN introduction, Perceptron, Multi-layer feed forward Networks with Back propagation

FUZZY LOGIC:

Fuzzy Sets, Operations on Fuzzy Sets, Membership Functions, Fuzzy Rules, Models, Fuzzy Reasoning and Fuzzy Inference Systems.

(Text Book-1:, Chapters (2 ,3 and 4), 8.1 to 8.3

15 Hours

UNIT – III

Decision Making and Expert Systems:

Single person, Multi person, Multi criteria and Multi stage decision making, Expert system features, architecture and applications

(Text Book-2:, Chapter s (1 , 2 and 3)

9 Hours

Course Outcomes:

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

1. Acquire Knowledge about different constitutes of Soft Computing making use of diagrams and its applications
2. Illustrate Genetic Algorithms (GA) – Conceptual GA algorithm, Reproduction operators Mutation and Cross over, Applications of GA. Utilize learning approaches and agents
3. Outline the neural networks basics, network architectures, back propagation algorithm and applications
4. Overview of Fuzzy logic concepts, Membership Functions, Fuzzy Rules and Describe Fuzzy Models, Fuzzy Reasoning and Fuzzy Inference Systems
5. Explain Single person, Multi person, Multi criteria and Multi stage decision making. Acquire knowledge on Expert system features, architecture and applications

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	1	2	3		1							1	2	2	
CO2	2	3	3		1							1	2	2	
CO3	2	2	3		1							1	2	2	
CO4	2	2	2		1							1	1	3	
CO5	1	2	3		1							1	1	3	

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

TEXTBOOKS:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, Neuro-Fuzzy and Soft Computing, Prentice-Hall of India, 2003.
2. Zimmermann, Hans-Jürgen, Fuzzy Sets, Decision Making, and Expert Systems, ISBN 978-94-009-3249-4, Kluwer Academic Publishers, Boston, 1987
3. Mitchell Melanie, An Introduction to Genetic AlgorithmsA Bradford Book The MIT Press, Cambridge, Massachusetts, London, England, Fifth printing, 1999
4. Ethem Alpaydın, Introduction to Machine Learning Second Edition The MIT Press Cambridge, Massachusetts London, England

REFERENCE BOOKS:

1. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
2. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1997.
3. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to FuzzyLogic using MATLAB", Springer, 2007.
4. S.N.Sivanandam · S.N.Deepa, " Introduction to Genetic Algorithms", Springer, 2007.
5. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers, 1992.

E-Books / Online Resources:

https://www.wileyindia.com/principles-of-soft-computing-2nd-ed.html

http://dl.offdownload.ir/ali/Neuro-FuzzyAndSoftComputing.pdf

MOOCs:

https://onlinecourses.nptel.ac.in/noc18_cs13/course

www.soft-computing.de/link.html

nptel.ac.in/courses/106105173/

SEE SCHEME:

There will be 8 questions of 20 marks each in the question paper divided into3 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 - I (VII Semester) - 2023-2024

Sl. No.	Code	Name
1.	20MA8X02	Linear Algebra (for all except CS, IS, EC, CCE & AIML)
2.	20HU8X03	Intellectual property rights (for all)
3.	20CV8X07	Environment Impact Assessment (for all except Civil)
4.	20ME8X08	Industrial Pollution Control (for all except Mechanical)
5.	20HU8X24	Professional and Cognitive Communique (for all)
6.	20ME8X28	Operations Management and Entrepreneurship (for all except Mechanical)
7.	20IS8X38	Introduction to Python Programming (for all except CS & IS)
8.	20BT8X40	Bio Fuel Engineering (for all except BT)
9.	20BT8X42	Solid Waste Management (for all except BT & Civil)
10.	20EC8X59	PCB Design (For all except E&C)
11.	20ME8X63	Innovation & Entrepreneurship (for all)
12.	20HU8X68	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.	20HU8X70	Overview of Indian Culture and Arts (for all)
14.	20HU8X71	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.	20HU8X72	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.	20HU8X74	Introduction to German Language (for all)
17.	20ME8X75	Sustainable Development Goals (for all)
18.	20IS8X76	Web Technologies (for all except CS & IS)
19.	20CS8X77	Programming in Java (for all except EC,CS & IS)
20.	20CS8X78	Data Structures & Algorithms (for all except EC,CS & IS)
21.	20EE8X79	Electric Vehicle Technology (for all except EE)
22.	20HU8X81	National Cadet Corps: Organization, Functions & Capabilities (for only NCC Cadet Students)
23.	20EC8X82	Fundamentals of Image Processing – a practical approach (Only for CV, ME & BT)
24.	20HU8X86	Introduction to Yakshagana (for all - who are familiar with kannada Language)
25.	20ME8X88	Marketing Management (for all except Mechanical)

OPEN ELECTIVE - II (VIII Semester)

Sl. No	Code	Name
1.	20MA8X01	Graph Theory (for all except CS & IS)
2.	20HU8X03	Intellectual property rights *(for all except for those who have taken the subject in the VII semester)*
3.	20BT8X05	Nanotechnology (for all except BT)
4.	20CV8X07	Environment Impact Assessment *(for all except Civil & except for those who have taken the subject in the VII semester)*
5.	20ME8X08	Industrial Pollution Control *(for all except Mechanical & except for those who have taken the subject in the VII semester)*
6.	20EE8X10	Non-Conventional Energy Systems *(for all except EE, Mech. & except for those who have taken the subject in the VII semester)*
7.	20CS8X15	Essentials of Information Technology (for all except CS & IS)
8.	20EC8X18	Consumer Electronics (for all except EC)
9.	20ME8X28	Operations Management and Entrepreneurship *(for all except Mechanical & except for those who have taken the subject in the VII semester)*
10.	20ME8X33	Human Resource Management (for all except Mechanical)
11.	20HU8X37	Linguistics and Language Technology (for all)
12.	20MA8X43	Number Theory (for all)
13.	20ME8X65	Automotive Engineering (For all except Mechanical)
14.	20CV8X67	Disaster Management (For all except Civil)
15.	20HU8X68	Introduction to Yoga *(for all except for those who have taken the subject in the VII semester)*
16.	20HU8X71	Principles to Physical Education *(for all except for those who have taken the subject in the VII semester)*
17.	20HU8X72	Introduction to Japanese language *(for all except for those who have taken the subject in the VII semester)*
18.	20HU8X74	Introduction to German Language (for all *except for those who have taken the subject in the VII semester)*
19.	20ME8X75	Sustainable Development Goals (for all *except for those who have taken the subject in the VII semester)*
20.	20CS8X80	Internet of Things (for all except EC,CS & IS)
21.	20IS8X83	Software Engineering Practices (for all except CS & IS)
22.	20IS8X84	Introduction to Cyber Security (for all except CS & IS)
23.	20EC8X85	Space Technology & Applications (for all except E&C)
24.	20HU8X86	Introduction to Yakshagana (for all - who are familiar with kannada language)

GRAPH THEORY

Course Code	20MA8X01	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

1. Explain subgraphs, bipartite graphs, isomorphic graphs etc. Apply the concept of trees and its properties
2. Distinguish between Hamilton and Eulerian graph. Distinguish between planar and nonplanar graphs and apply their properties to solve problems.
3. Represent a graph in terms of adjacency matrix, incidence matrix etc. and vice-versa.
4. Find the shortest path between two vertices in a graph. Find minimal spanning tree.

UNIT – I

Introduction to graphs   **11 Hours**
Graphs and Graph Models, digraphs, Konigsberg bridge problem. Special Types of Graphs: Subgraphs-spanning and induced subgraphs, Isomorphism of graphs. Some Special Simple Graphs, complete graph, Bipartite Graphs.
Connectivity: point and line connectivity
Trees and its properties.

Eulerand Hamilton graphs   **4 Hours**
Eulerian and Hamiltonian graphs and their applications.

UNIT – II

Planar graphs: Euler's polyhedron formula, outer planar graphs, applications   **9 Hours**
Colorability: Chromatic number, five color theorem, chromatic polynomial, Applications of graph coloring.

Representation of graphs: **6 Hours**
adjacency matrix, incidence matrix, circuit matrix, cut set matrix. Path matrix

UNIT – III

Network Flows: Max -flow and Min-cut Theorem(statement), problems.   **04 Hours**
Shortest paths in weighted graphs:
Dijkstra's algorithm to find shortest paths.

Spanning trees: **05 Hours**
Algorithms to find a spanning tree, minimal spanning tree-Kruskal's & Prim's algorithm.

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

1.	Distinguish between bipartite and complete bipartite graphs, identify whether two graphs are isomorphic, find subgraphs of a graph etc.
2.	Distinguish between Eulerian and Hamiltonian graphs.
3.	Identify whether a graph is planar and to find the chromatic polynomial of a graph.
4.	Representing graphs in Matrices.
5.	Apply algorithmic methods to find the shortest path between two given vertices. Use a suitable algorithm to find a minimal spanning tree.

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	3										
CO2	2	1										
CO3	2	3										
CO4	3	2										
CO5	3	2										

1: Low 2: Medium 3: High

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 **20** 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.	F. Harary, "Graph theory", Narosa Publishing House, 1988.
2.	Narsing Deo, "Graph Theory with applications to Engg. and Comp. Sciences", PHI,1974.
3.	"DiscreteMathematicsanditsapplications",KennethH.Rosen,TataMcGrawHill,VEdition-2003.

REFERENCE BOOKS:

1.	D.B.West, "Introduction to Graph Theory", PHI,2001.
2.	Chartrand and Zhang, "First Course in Graph Theory", 2012

E Books / MOOCs/ NPTEL

1.	http://diestel-*graph-theory*.com.
2.	https://nptel.ac.in/courses/111106102

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LINEAR ALGEBRA

Course Code	20MA8X02	**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 **20** 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, 2004.**
2.	David C.Lay, "Linear Algebra and its Applications",3rd edition, Pearson Education (Asia) Pte. Ltd, 2005.
REFERENCE BOOKS:	
1.	M. Artin , Algebra Prentice Hall of India.2004.
2.	Gilbert Strang, "Linear Algebra and its Applications", 4th edition, Thomson Learning Asia, 2003.
3.	Bernard Kolman and David R. Hill, "Introductory Linear Algebra with Applications", Pearson Education (Asia) Pte.Ltd 7th edition ,2003.
4.	Sheldon Axler, "Linear Algebra Done Right", Springer International Publication, Third Edition,2015.

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INTELLECTUAL PROPERTY RIGHTS

Course Code	20HU8X03	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, 2017	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

<table>
<tr><td colspan="2" align="center">UNIT - III</td></tr>
<tr><td>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)</td><td>7</td></tr>
<tr><td></td><td></td></tr>
</table>

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., 2007
2.	Kankanala C., Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd., 2007
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 2001,
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 2000
8.	Wadehra, B. L. Law relating to patents, trademarks, copyright designs & geographical indications 2 ed. Universal Law Publishing 2000
9.	Sinha, Prabhas Chandra Encyclopedia of Intellectual Property Rights, 3 Vols. Eastern Book Corporation, 2006.
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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NANOTECHNOLOGY			
Course Code	**20BT8X05**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

*Prerequisites***:** Chemistry, Physics
*Corequisites***:** Nil

Course Learning Objectives:
The objective of this course is
- To learn fundamental concepts of nanoscience and nanotechnology
- To appreciate the application of nanoscience to various fields of engineering.

UNIT - I
INTRODUCTION
Introduction to nanoscience, A Brief History of the Super Small, Definition of nanotechnology, Bottom-Up versus Top-Down; Discussions on nanofabrication, Nanolithography(Dip pen, photo, X-ray, Electron beam, nanosphere lithography), Structure-property relationships in materials, Fabrication of Hard Materials.
NANOMATERIAL AND NANO TOOLS
Zero dimensional: Nano particle, 1-D: Nano wires, nano rods, 2-D: Thin films, Special nanomaterials: Buckyballs (Fullerenes), Nanotubes, nanowire, Dendrimers, Nanoshells, magnetic nanoparticle, Quantum Dot (Nanocrystals), self-assembled monolayers, Scanning probe microscopy (Scanning tunneling microscopy, Atomic force microscopy). Characterization of nanomaterials: Physical, chemical and structural. Applications of nanomaterial

15 Hours

UNIT – II

MICROFLUIDICS
Microflows (Laminar flow), Hagen-Pouiselle equation, micromixing, microvalves & micropumps, Need for the microfluidics, Fabrication of Soft Materials, application of microfluidics.Microfluidics and their applications to lab on chip.
MEMS
Introduction and Overview, Design of MEMS, Sensors, Material aspect of MEMS, Electromagnetic Transducers, Mechanical Transducers, Chemical Transducers, Optical Transducers – Applications of optical and chemical transducers. Recent Developments in MEMS and Nanochips. Application of MEMS.

15 Hours

UNIT - III
APPLICATIONS
Sporting goods equipment, Apparel industry, Cosmetics, Appliances, Automobile/vehicle industry, Paint and Other water resistance coatings, Removing windshield fog, Medical bandages, Organic light-emitting displays, Medical applications, Food and Agriculture. Nanotechnology for data storage. Risk assessment, management, ethical aspects.

9 Hours

Course Outcomes:
At the end of this course student will be able to
1. Understand the terminologies of nanotechnology, nanofabrication and structure-property relationship of materials.
2. Learn and understand synthesis of nanomaterials, structures and their methods of characterization.
3. Understand the concepts of microfluidics and its applications
4. Apply nanotechnology concepts in the field of MEMS
5. Apply nanotechnology concepts in various engineering discipline and assess the risk involved in nanotechnology products

Mapping of POs & COs:

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

TEXTBOOKS:

1. Lindsay, S.M. *Introduction to Nanoscience*, Oxford University Press, 2009.
2. Robert Kelsall and Hamley, I. (Ed.). *Nanoscale Science and Technology*, Wiley, 2005.
3. Bharat Bhushan (Ed.), *Springer Handbook of Nanotechnology*, 3rd Ed., Springer, 2010.

REFERENCE BOOKS:
1. Booker, R. and Earl Boysen (Eds), *Nanotechnology*, Wiley Dreamtech, 2005.
2. Murthy, D.V.S. *Transducers and instrumentation*, Prentice Hall of India, 2010.
3. Schmidt, G. *Nanotechnology Assessment and perspectives*, Springer, 2006.
4. Ratner M. and Ratner, D. *Nanotechnology – A gentle Introduction to the Next Big Idea*, Pearson Education, 2005.
5. Silberzan, J.B.P. *Microfluidics for Biotechnology*, ARTECH house, 2010.
6. Cao, G. *Nanostructure and nanomaterial*, World scientific, 2011.

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ENVIRONMENTAL IMPACT ASSESSMENT			
Course Code	20CV8X07	**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. 2010. 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, 2009. Methods of Environmental Impact Assessment, 3rd edition. New York, NY: Routledge.
2. Hanna, K.S. 2009. Environmental impact assessment. Practice and Participation. 2nd edition. Oxford, University Press, Don Mills, Ontario.

NPTEL SOURCES
http://nptel.ac.in/courses/120108004/
http://nptel.ac.in/courses/120108004/module3/lecture3.pdf

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INDUSTRIAL POLLUTION CONTROL			
Course Code	20ME8X08	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 : 20ME8X08/ Industrial Pollution Control														
Course Outcomes (CO)	**Program Outcomes (PO)**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C-20ME8X08.1	2								1	1		1		
C-20ME8X08.2	2								1	1		1		
C-20ME8X08.3	2								1	1		1		
C-20ME8X08.4	2								1	1		1		
C-20ME8X08.5	2								1	1		1		

1: Low   2: Medium   3: High

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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NON-CONVENTIONAL ENERGY SYSTEMS			
Course Code	20EE8X10	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 and Mechanical Engineering

Prerequisite:
Students are expected to have a fundamental knowledge of Basic Electrical Engineering (18EE104)

Course Learning Objectives (CLO):
1. To illustrate the principle of extraction of energy from conventional, nonconventional sources.
2. To demonstrate the working principle and applications of solar based thermal, electrical and PV systems.
3. To justify the usage of energy storage techniques and understand the process of design and implement wind based energy conversion systems.
4. To understand the process of design and implement biomass based energy conversion systems.

UNIT – I

Energy Sources: Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Classification of Energy Resources, Conventional Energy Resources- Availability and their Limitations, Non-Conventional Energy Resources- Classification, Advantages, Limitations, Comparison of Conventional and Non-Conventional Energy Resources, World Energy Scenario, Indian Energy Scenario.

3 Hours

Solar Energy Basics: Introduction, Solar Constant, Basic Sun-Earth Angles – definitions and their representation, Solar Radiation Geometry (numerical problems), Estimation of Solar Radiation of Horizontal and Tilted Surfaces (numerical problems), Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer.

5 Hours

Solar Thermal Systems: Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, Concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green House.

4 Hours

Solar Electric Systems: Solar Thermal Electric Power Generation, Solar Pond and Concentrating Solar Collector(Parabolic Trough, Parabolic Dish, Central Tower Collector), Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fundamentals, characteristics, classification, construction of module, panel and array.
Solar PV Systems- stand-alone and grid connected, Applications- Street lighting, Domestic lighting and Solar Water pumping systems.

4 Hours

UNIT – II

Energy Storage: Introduction, Necessity of Energy Storage and Methods of Energy Storage (Classification and brief description using block diagram representation)

4 Hours

Wind Energy: Introduction, Wind and its Properties, History of Wind Energy Wind Energy Scenario – World and India. Basic principles of WECS, Classification, Parts of a WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS. Wind site selection consideration, Advantages and Disadvantages of WECS.

4 Hours

Biomass Energy: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production

from waste biomass, Factors affecting biogas generation, types of biogas plants- KVIC and Janata model, Biomass program in India

6 Hours

UNIT – III

Energy From Ocean: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant, Classification of Tidal Power Plant, Estimation of Energy – Single basin and Double basin type TPP (no derivations, Simple numerical problems), Advantages and Limitation of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle), Hybrid cycle, Site-selection criteria, Biofouling, Advantages & Limitation of OTEC

5 Hours

Emerging Technologies: Fuel Cell, Small Hydro Resources, Hydrogen Energy and Wave Energy (Principle of Energy generation using block diagrams, advantages and limitations)

4 Hours

Course Outcomes:
At the end of the course student will be able to
1. Describe non-conventional energy sources and solar radiation geometry to estimate and measure solar radiation.
2. Apply the principle of solar radiation into heat to understand the operation of solar thermal and solar electric systems.
3. Describe energy storage methods and wind–energy conversion systems to understand the factors influencing power generation.
4. Review the biomass conversion technologies to design biomass-based energy systems.
5. Describe tidal, ocean thermal and fuel cell energy conversion systems to understand emerging non-conventional energy technologies.

Course Outcomes: Mapping with Program Outcomes												
Program Outcomes→ ↓ Course Outcomes:	1	2	3	4	5	6	7	8	9	10	11	12
20EE8X10.1	2	3				1	2	1				
20EE8X10.2	2	3				1	2	1				
20EE8X10.3	2	3				1	2	1				
20EE8X10.4	2	3				1	2	1				
20EE8X10.5	2	3				1	2	1				

1: Low 2: Medium 3: High

SEE Question Paper Pattern:

- There will be **8** questions of **20** 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**.

TEXTBOOK:
1. Rai G. D*.,* "Non-Conventional Sources of Energy", 4th Edition, Khanna Publishers, New Delhi, 2007

REFERENCE BOOKS:
1. Mukherjee D. and Chakrabarti, S., "Fundamentals of Renewable Energy Systems", New Age International Publishers, 2005.
2. Khan, B. H., "Non-Conventional Energy Resources", TMH, New Delhi, 2006
3. S. P. Sukhumi, J. K. Nayak "Solar Energy: Principles Collection and Storage", 3rd edition, McGraw-Hill Education (India) , 2009

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ESSENTIALS OF INFORMATION TECHNOLOGY			
Course Code	**20CS8X15**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**SEE Marks**	**50**
Total Hours	**39**	**Credits**	**03**

<u>**Course Learning Objectives:**</u>

This Course will enable students to
1. Outline the fundamentals of python programming.
2. Implement the object oriented concepts using python programming.
3. Describe the basic concepts of Relational Database Management System.
4. Apply the normalization to the Databases and develop databases using SQL and PL/SQL Queries.
5. Develop the data base connectivity in integration with python and perform various Database operations.

UNIT - I

PROGRAMMING FUNDAMENTALS Introduction to Programming: Why Programming, What is Computer Program, What is an Algorithm, Flowchart, Pseudo Code; Python Fundamentals: – Introduction to python, Variables and Data Types, Comments, Input Function, Operators, Coding Standards, Integrated Development Environment(IDE) ;Control Structures: Selection Control Structures, ,Looping/Iterative Control Structures; Data Structures: String , List, Dictionary and Tuple ,Set, Functions: Built-in functions, User-defined Functions, Recursion.

OBJECT ORIENTED PROGRAMMING USING PYTHON Introduction to Object Oriented Paradigm: Abstraction and Entity, Encapsulation and Data hiding, Class and Object, Unified Modelling Language (UML), Object Oriented Approach, Class Variables, Class methods and Static Methods, Documentation, Inheritance & Polymorphism: UML: is-a relationship
(Generalization), Types of Inheritance, Multiple Inheritance, Polymorphism, Benefits of OOP,
Memory Management in Python, Relationships: has-a relationship: Aggregation & Composition, uses-a relationship; File handling, Exception Handling, Raising Exceptions

15 Hours

UNIT - II

RELATIONAL DATABASE MANAGEMENT SYSTEM   Data and Need for DBMS: Data – Is it important, What is Data, Do we need to store data, How to Store / Handle Data, What is DBMS and its Models, Functional Needs of DBMS, Data perspectives in DBMS; Relational Model and Keys: What is RDBMS, Data representation in RDBMS, Keys in RDBMS; Database Development Life Cycle; Data Requirements; Logical Database Design: Different Approaches in Logical Design, ER Modeling, ER Notations, Steps in ER Modeling; Physical Database Design: Converting ER Model to Relational Schema ;Normalization: Functional Dependency, First
Normal Form: 1NF, Second Normal Form: 2NF, Third Normal Form: 3NF, Normalization
Guidelines;

Implementation with SQL: What is SQL, Data types and Operators in SQL, SQL Statements: SQL - Built-in Functions; SQL - Group by and Having Clauses Joins: Inner Join, Outer Join, Self-Join, Sub Queries: Independent Sub queries, Correlated Sub queries, Index, Views,
Transactions, PL/SQL

15 Hours

UNIT - III

PYTHON DATABASE INTEGRATION Why Database Programming, Python Database
Integration – Pre-requisites and Installation, SELECT Operation: Retrieve Data from Database, Attributes of Cursor object, Bind variables, CREATE and INSERT Operation: Creating a table, Insert Operation, Inserting Multiple Records, UPDATE Operation, DELETE Operation, Exception Handling.

9 Hours

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

1. Explain the basic program constructs of Python Programming.
2. Design and apply the object oriented programming construct using Python to build the real world application.
3. Summarize the concepts related to Relational Database Management System.
4. Design and develop databases from the real world by applying the concepts of Normalization using SQL and PL/SQL.
5. Perform the various Database operations by connecting Python with Database.

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOKS:

1. Kenneth A. Lambert, "The Fundamentals of Python: First Programs, 2012", Cengage Learning.
2. Magnus Lie Hetland, "Beginning Python from Novice to Professional", Second Edition.
3. Mark Summerfield, Programming in Python 3 – "A Complete Introduction to the Python Language", Second Edition.
4. Elmasri, Navathe, "Fundamentals of Database Systems", Third edition, Addison Wesley

REFERENCE BOOKS:

1. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, ISBN:9780-13274718-9, 2013.
2. Raghu Ramakrishnan and Johannes Gehrke: "Database Management Systems" (Third Edition), McGraw-Hill, 2003.

SEE SCHEME:

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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CONSUMER ELECTRONICS			
Course Code	**20EC8X18**	**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. Learn and design operating principles of "real world" electronic devices
2. Study broader view of key principles of electronic device's operation and presents a block circuit diagram.
3. Learn to integrate the many different aspects of emerging technologies and able to build unique mix of skills required for careers.

UNIT – I

Sound: Properties of sound and its propagation, Transducers (Micro Phone, Loud Speakers), enclosures, mono-stereo, Amplifiers, Multiplexers, mixers, Synthesizers.
Vision: B/W TV, CTV concepts, B/W & Color Cameras, Displays.

15 Hours

UNIT – II

Recording and Playback: Optical discs; recording and playback, audio and video systems, Theatre Sound, Studios, Editing.
Communications and Broadcasting: Switching Systems, Land lines, Modulation, Carrier, Fiber optics, Radio and TV broad casting
Data Services: Data services, mobiles, terrestrial & Satellite Systems, GPS, Computers, internet Services.

15 Hours

UNIT – III

Utilities: Fax, Xerox, Calculators, Microwave ovens, Washing Machines, A/C & refrigeration, Dishwashers, ATMS, Set -Top boxes, Auto Electronics, Industrial Electronics, Robotics, Electronics in health / Medicine, nano- technologies.

9 Hours

Course Outcomes:
At the end of the course the student will be able to
1. Recall basics of sound.
2. Recall basics of television and camera.
3. Explain basic working of Recording, storage devices,
4. Explain basics of communication and broadcasting.
5. Recall basic working of commonly used electronic gadgets

TEXTBOOKS:
1. Anand, **"Consumer Electronics",** Khanna publications, 2011.
2. Bali S. P., **"Consumer Electronics",** Pearson Education, 2005.

REFERENCE BOOK:
1. Gulati R. R., **"Modern Television Engineering",** Wiley Eastern

Scheme of SEE Question Paper
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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PROFESSIONAL & COGNITIVE COMMUNIQUÉ

Course Code	20HU8X24	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

Etiquettes & Workplace

Etiquette, Workplace Etiquettes, Workplace Readiness Skills, Significance of Cross-Cultural Understanding; Cultural Sensitivity, Impact of social media in Workplace

15

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

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

15

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→ ↓ Course Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓ 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, 2009.
2.	Bailey, Jane, et al. "Negotiating with Gender Stereotypes On Social Networking Sites: From "Bicycle Face" to Facebook." Journal of Communication Enquiry 37.2 (2013): 91-112.
3.	Barry, Peter. Beginning Theory. New Delhi: Viva Books, 2010.
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, 2003.
6.	Gauntlett, David. Media, Gender and Identity: An Introduction. London: Routledge, 2008
7.	Pilcher, Jane, and Imelda Whelehan. 50 Key Concepts in Gender Studies. London: Sage, 2004. 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 (2004): 199-215.Web.

E-RESOURCES:

1.	http://www.cyberpsychology.eu/view.php?cisloclanku=2009061501/ >.
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	20ME8X28	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, 2005.
4. **Total Quality Management**: Dale H. Besterfield, Pearson Education, 2003.
5. **Dynamics of Entrepreneurial Development & Management** –
   Vasant Desai – Himalaya Publishing House
6. **Entrepreneurship Development** – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (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. 2005, 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.

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-20ME8X28.1	3	1	0					1	1	1	1				
C-20ME8X28.2	1	2	0						1	1	3				
C-20ME8X28.3	2	2	0				1	0	1	1	3				
C-20ME8X28.4	3	1	0			1	0	1	1		2				
C-20ME8X28.5	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 **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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HUMAN RESOURCE MANAGEMENT			
Course Code	20ME8X33	**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) To develop a meaningful understanding of HRM theory, functions and practices.
2) To understand concepts and skills recruitment.
3) To understand the concepts of training and development.
4) To deal with employees' grievances, safety and health types of organizations.
5) To understand the concepts of e-HRM.
UNIT - I
Human Resource Management & HRP: Introduction, meaning, nature, scope of HRM. Major functions of HRM, Personnel Management vs Human Resource Management, job design, job evaluation, job analysis, job specification, job enlargement, job enrichment. Role of HR Manager.HR Planning. Process HRP. **8 Hours**
Recruitment: Definition, Sources and Methods of Recruitment   **Selection:** Definition and Process of Selection. Cost benefit analysis of selection.   **Placement:** Meaning, Induction/Orientation, Internal Mobility, Transfer, Promotion, Demotion and Employee Separation. Performance Appraisal methods   **8 Hours**
UNIT – II
Training and development: Training v/s development, stages in training, Training Methods, Executive Development, Methods and Development of Management Development, Career and Succession Planning.   **Compensation**: employee remuneration, rewards, Wage and Salary Administration, Bonus, fringe benefits. Internal Mobility, External Mobility, Trade union Act (Amendment) 2001.   **7 Hours**
Employee Grievances: Employee Grievance procedure. Discipline procedure   **Collective bargaining;** Characteristics, Necessity, Forms   **Safety & Health;** Industrial accidents, Safety   **Quality circle;** Meaning, Structure   **8 Hours**

UNIT – III

IHRM. Managing IHRM. e-HR Activities, Global recruitment, selection, expatriates. Industrial conflict – Causes, Types, Prevention and Settlement.

e-HRM; Aspects of e-HRM,e-Job design & Analysis, Ethical issues in employment

8 Hours

Course Outcomes (CO):

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

CO 1	Describe the basic concepts of HRM & HRP.
CO 2	Elucidate the HRM functions of recruitment, selections, appraisal etc.
CO 3	Apply the training, development and compensation methods in HRD.
CO 4	Identify the employee grievances and to spell out the remedial measures.
CO 5	Infer the concepts of e-HRM and I-HRM.

TEXTBOOK:

1. Essentials of Human Resource Management & Industrial Relations-P Courseba Rao, Third Revised Edition

REFERENCE BOOKS:

1) Human Resource Management - John M. Ivancevich, 10/e, McGraw Hill.
2) Human Resource Management-Flippo
3) Human Resource Management - Lawrence S. Kleeman, Biztantra , 2012.
4) Human Resource Management – Aswathappa K HPH

MOOC/NPTEL Resources:

1) http://edx.nimt.ac.in/courses/course-v1:nimtX+PGDM1212+2017_H1/about
2) http://nptel.ac.in/courses/122105020/

Course Articulation Matrix

Course Code / Name : 20ME8X33 / HUMAN RESOURCE MANAGEMENT														
Course Outcomes (CO)	**Program Outcomes (PO)**												**PSO**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C-20ME8X33.1	3	-	-	-	-	1	-	-	1	1	-	1	-	-
C-20ME8X33.2	3	-	-	-	-	1	-	-	1	1	-	1	-	-
C-20ME8X33.3	3	-	-	-	-	1	-	-	1	1	-	1	-	-
C-20ME8X33.4	3	-	-	-	-	1	-	-	1	1	-	1	-	-
C-20ME8X33.5	3	-	-	-	-	1	-	-	1	1	-	1	-	-

1: Low   2: Medium   3: High

Scheme of SEE Question Paper

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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LINGUISTICS & LANGUAGE TECHNOLOGY

Course Code	20HU8X37	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.	Introspect about the consciousness in one's language
2.	Learn pronunciation and how the process helps to communicate effectively.
3.	Build contextual speech and writing with the pedagogy in sentence structure.
4.	Improve skill of applying language to enunciate words.
5.	Progress on the speech aspects by understanding the acquisition of Second Language.

UNIT - I

Introduction to Linguistics Broad understanding of Linguistics, Language and characteristic features, Scientific Language, Levels of Linguistic Analysis (Phonetics, Phonology, Morphology, Syntax and Semantics); Approach to Linguistics (Traditional, Structural and Cognitive).	8
Phonology and Morphology Perspectives in Linguistics, Phonemes, Allophones, Phonemic Analysis, Morphology and Morphemes, Word building process, Morphological Analysis.	8

UNIT - II

Syntax Constituent structure (Simple Sentence, Noun Phrase, Verb Phrase, Prepositional Phrase, Adjective Phrase, Adverb Phrase, Structure Rules), Tree Diagrams, Case	16

UNIT – III

Sociolinguistics & Psycholinguistics, Artificial Intelligence Notion of Language Variety, Languages in Contact, Language and Mind, Error Analysis.	7

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

1.	Understand the importance of language and its facets.
2.	Demonstrate knowledge of sounds and competence in process of word building.
3.	Evolve to reason the constituent parts of a sentence.
4.	Understand the techniques of how 'meaning' is applied.
5.	Analyze errors in day-to-day-conversations and how language is related to society.

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			1			2		
CO2			2						2	2				
CO3	2	3		3					3	2				
CO4					2				1	2				
CO5		2				2	1					1		

1: Low 2: Medium 3: High

REFERENCE MATERIALS:

1.	Akmaijan, A, R. A. Dimers and R. M. Harnish. Linguistics: An Introduction to Language and Communication. London: MIT Press, 1979.
2.	Chomsky, Noam. Language in Mind. New York: Harcourt Brace Jovanovich, 1968.
3.	Fabb, Nigel. Sentence Structure. London: Routledge, 1994.
4.	Hockett, C. A Course in Modern Linguistics. New York: Macmillan, 1955.
5.	O'Grady, W., O. M. Dobrovolsky and M. Aronoff. Contemporary Linguistics: An Introduction. New York: St. Martin's Press, 1991.
6.	Pride, J. B. and J. Holmes. Sociolinguistics. Harmondsworth: Penguin, 1972.
7.	Richards, J. C. Error Analysis: Perspectives in Second Language Acquisition. London: Longman, 1974.
8.	Salkie, R. The Chomsky Update: Linguistics and Politics. London: Unwin Hyman Ltd., 1990.
9.	Sinclair, J. M. C. H. and R. M. Coulthard. Towards an Analysis of Discourse. Oxford: OUP, 1975.
10.	Thomas, Linda. Beginning Syntax. Oxford: Blackwell, 1993.
11.	Verma, S. K. and N. Krishnaswamy. Modern Linguistics: An Introduction. New Delhi: OUP, 1989.
12.	Wekker, Herman and Liliane Haegeman. A Modern Course in English Syntax. Kent: Croom Helm, 1985.

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INTRODUCTION TO PYTHON PROGRAMMING			
Course Code	20IS8X38	**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, 2011, Cengage Learning, ISBN: 978-1111822705

ADDITIONAL RESOURCES:
1. Think Python. PDF is free.

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.**

BIOFUEL ENGINEERING			
Course Code	20BT8X40	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:

CO	PO											
	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, 2008.
2. Jonathan R.M, *Biofuels – Methods and Protocols (Methods in Molecular Biology Series),* Humana Press, New York, 2009.
3. Olsson L. (Ed.), *Biofuels (Advances in Biochemical Engineering/Biotechnology Series,* Springer-Verlag Publishers, Berlin, 2007.
4. Glazer, A. and Nikaido, H. *Microbial Biotechnology – Fundamentals of Applied Microbiology*, 2 Ed., Cambridge University Press, 2007.
5. Godfrey Boyle (Ed). *Renewable Energy- Power for sustainable future*, 3rd Ed. Oxford. 2012.
6. Ramachandran, T. V. *Management of municipal solid waste*. Environmental Engineering Series. Teri Press, 2016.

SEE QUESTION PAPER PATTERN:

Unit No.	I	II	III
Questions to ask (20 marks/Qn)	3	3	2
Questions to answer	2	2	1

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SOLID WASTE MANAGEMENT			
Course Code	20BT8X42	**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 2011.
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:

CO	PO											
	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, 2000.

SEE QUESTION PAPER PATTERN:

Unit No.	I	II	III
Questions to ask (20 marks/Qn)	3	3	2
Questions to answer	2	2	1

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NUMBER THEORY			
Course Code	20MA8X43	**CIE Marks**	50
Teaching Hours/Week (L:T:P)	3:0:0	**SEE Marks**	50
Total Hours	39	**Credits**	03

Course Learning Objectives:

1.	Understand the divisibility of integers ,study of prime numbers and basic properties of congruences.
2.	Study Fermat's little theorem and understand Euler's function.
3.	Study the existence of primitive roots and quadratic residues.
4.	Study the cryptographic applications in number theory.

UNIT - I

Divisibility and the theory of congruences
Division algorithm, Euclid's algorithm for the greatest common divisor. Linear Diophantine equations. Prime numbers, fundamental theorem of arithmetic. Basic properties of congruences, Linear congruences and Chinese reminder theorem.

15 Hours

UNIT - II

Fermat's theorem, Wilson's theorem, Euler's Phi function, Euler's theorem.

Primitive roots and Quadratic congruences   16 **Hours**
Order of an integer modulo n, primitive roots for primes, Euler's criterion, Legendre symbol and its properties

UNIT - III

Cryptography
Introduction to public key cryptography, RSA cryptosystem, an application of primitive roots to cryptography

8 Hours

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

1.	Use divisibility and Greatest common divisor in Euclidean algorithm. Solve Diophantine equations. Identify prime factorization of an integers.
2.	Understand the properties of congruences. Use Chinese reminder theorem to find solution of system of linear congruences
3.	Use Fermat's Little Theorem and Wilson's Theorem. Use of Euler's Phi function.
4.	Identify primitive roots of an integers. Apply Euler's criterion and Legendre symbols.
5.	Code and decode numbers in the RSA cryptosystem.

Course Outcomes Mapping with Program Outcomes & PSO

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

1: Low 2: Medium 3: High

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 **20** 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.	D. Burton; Elementary Number Theory, McGraw-Hill, 2005
2.	Niven, H.S. Zuckerman & H.L. Montgomery, Introduction to the Theory of Numbers, Wiley,2000.
REFERENCE BOOKS:	
1.	H. Davenport, The Higher Arithmetic, Cambridge University Press, 2008.
2.	G.A. Jones & J.M. Jones, Elementary Number Theory, Springer UTM, 2007.
3.	Thomas Koshy, Elementary Number Theory with Applications, 2nd edition, Elsevier, 2007
4.	Fundamentals of Number Theory by William J. LeVeque
E Books / MOOCs/ NPTEL	
1.	http://refkol.ro/matek/mathbooks/ro.math.wikia.com%2520wiki%2520Fisiere pdf_incarcate/ Elementary-Number-Theory.pdf
2.	https://nptel.ac.in/courses/111104138
3.	https://nptel.ac.in/courses/111103020

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PCB DESIGN			
Course Code	**20EC8X59**	**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	20
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	**20ME8X63**	**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, 2015.

REFERENCE BOOKS:	
1	Dick Whittington, "Digital Innovation and Entrepreneurship", Cambridge University Press, 2018.

Course Articulation Matrix:

Course Outcomes (CO)	Program Outcomes (PO)												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C-20ME8X63.1	3	2				1	1		1			1	3	1
C-20ME8X63.2	3	2				1	1		1			1	3	1
C-20ME8X63.3	2	2				1	1		1			1	3	1
C-20ME8X63.4	2	2				1	1		1			1	3	1
C-20ME8X63.5	3	2				1	1		1			1	3	1

Course Code / Name : 20ME8X63/ INNOVATION AND ENTREPRENEURSHIP

1: Low   2: Medium   3: High

Scheme of SEE Question Paper

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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AUTOMOTIVE ENGINEERING			
Course Code	20ME8X65	**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	Get an idea on the different components of an engine and its types with lubrication system.
2	Understand the fuel supply system and ignition systems used in automobiles.
3	Demonstrate the working of transmission system.
4	Explain the importance of suspension system, steering geometry and drives in automobiles
5	Know the concept of braking system, tyres and emission control.

UNIT – I
ENGINE COMPONENTS AND COOLING & LUBRICATION SYSTEMS: SI & CI engines, Cylinder-arrangements and their relative merits, Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams, Choice of materials for different engine components, engine positioning, cooling requirements, methods of cooling, thermostat valves, different lubrication arrangements, crankshaft/flywheel position sensor, accelerator pedal sensors, engine coolant water temperature sensor.   **8 Hours**   **FUEL SUPPLY SYSTEMS FOR SI AND CI ENGINES:** Fuel mixture requirements for SI engines, types of carburetors, simple carburetor, multi point and single point fuel injection systems, CRDI, fuel transfer pumps: AC Mechanical Pump, SU Electrical Pumps, injectors, Fuel gauge sensor, Throttle position sensor, Mass air flow sensors.   **5 Hours**   **IGNITION SYSTEMS:**   Battery Ignition systems, magneto Ignition system, Transistor assisted contacts. Electronic Ignition, Automatic

Ignition advance systems, Lighting systems, Rain/Light sensors, starting device (Bendix drive)	
	2 Hours
UNIT – II	
POWER TRAINS:	
Clutches- Single plate, multiplate and centrifugal clutches. Gear box: Necessity for gear ratios in transmission, Constant mesh gear box, Synchromesh gear box, principle of automatic transmission, Vehicle Speed Sensors, calculation of gear ratios, Types of transmission systems. No numerical.	
	8 Hours
DRIVE TO WHEELS:	
Propeller shaft, universal joints, Hotchkiss. and torque tube drives, differential, rear axle, steering geometry, camber, king pin inclination, included angle, castor, toe-in & toe-out, condition for exact steering, power steering, over steer, under steer & neutral steer, Steering angle sensors, numerical problems.	
	5 Hours
SUSPENSION AND SPRINGS:	
Requirements, leaf spring, coil spring, Torsion bar suspension systems, independent suspension for front Wheel, Air suspension system**.**	
	2 Hours
UNIT – III	
BRAKES:	
Types of brakes, mechanical, compressed air, vacuum and hydraulic braking systems, construction and working of master and wheel cylinder, brake shoe arrangements, Disk brakes, Drum brakes.	
	5 Hours
TYRES	
Desirable tyre properties, Types of tyres.	
	1 Hour
AUTOMOTIVE EMISSION:	
Automotive exhaust emissions, sources and emission control method: EGR, SCR, Emission Standards, Exhaust sensors.	
Electric Vehicles.	
	3 Hours

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

CO 1	**Describe** and demonstrate the layout of an automobile and components of an automobile engine. Explain cooling and lubrication systems.
CO 2	**Explain** and demonstrate the fuel supply and Ignition systems for SI and CI engines.
CO 3	**Describe** and demonstrate the transmission system
CO 4	**Explain** and demonstrate the components of drive to wheel and suspension system, calculate the parameters of steering geometry.
CO 5	**Describe** and demonstrate automotive braking system. Explain types and construction of tyres and wheels. Explain the significance of automotive emissions and its controlling methods.

TEXTBOOKS:

1. Automotive Mechanics by S. Srinivasan, Tata McGraw Hill, 2003
2. Automobile Engineering, Kirpal Singh, Vol I and II, 2013.
3. Automotive Electrical and Electronics, A. K. Babu, Khanna Publishers, 2nd edition, 2016

REFERENCE BOOKS :

1. Automobile Engineering, R. B. Gupta, Satya Prakashan, 4th Edn., 1984 .
2. Automobile Engineering, Narang, Khanna Publishers 2002
3. Automotive Mechanics, Crouse, McGraw Hill 2002
4. Automotive Mechanics, Joseph Heithner 2000
5. Automobile Mechanics by N. K. Giri, Khanna publishers 2002
6. Newton and Steeds Motor Vehicle, Butterworth, 2nd Edn. 1989.
7. Automobile Engineering by K. K. Jain and R. B_ Arshana, Tata McGraw Hill, 2002
8. Automobile Mechanics, A.K. Babu & S.C. Sharma, T.R. Banga, Khanna Book Publishing
9. A Textbook of Automobile Engineering, R.K. Rajput, Laxmi Publications

List of proposed Experiments in Automotive Laboratory: **4 Hours**

1. Study of Automotive - Chassis & superstructure/body and its functions. Also involves study of cut section of wheel & tyres (bias and radial types).
2. Study of more commonly used tools and equipment in automotive shop.
3. Study of carburetors and petrol & diesel fuel injection systems
4. Demonstration and study of Front axle and steering system
5. Demonstration and study of various suspension systems
6. Power train - Dismantling and assembly of single/multi cylinder Engine.
7. Power train - Study of clutch mechanism. Demonstration and study of dry friction clutches - Single plate & multi-plate types
8. Power train - Demonstration and study of transmission system - Gear box
9. Power train - Demonstration and study of Universal joints, propeller shaft, final drives, differential, and rear axles
10. Demonstration and study of brake mechanism (hydraulic type) and study of disc and drum brakes
11. Field visit to Automotive Servicing Station - Study of electrical system, wheel alignment (measuring and adjustment of castor, camber, king-pin inclination, toe-in and toe-out), automotive emission control systems.

(The details of each experiment to be given out as handout to each student or may be uploaded in Intranet)

Course Articulation Matrix:

<table>
<tr><th colspan="15">Course Code / Name: 20ME8X65 / Automotive Engineering</th></tr>
<tr><th rowspan="2">Course Outcomes (CO)</th><th colspan="12">Program Outcomes (PO)</th><th colspan="2">PSO</th></tr>
<tr><th>PO1</th><th>PO2</th><th>PO3</th><th>PO4</th><th>PO5</th><th>PO6</th><th>PO7</th><th>PO8</th><th>PO9</th><th>PO10</th><th>PO11</th><th>PO12</th><th>PSO1</th><th>PSO2</th></tr>
<tr><td>C-20ME8X65.1</td><td>3</td><td>1</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>3</td><td>1</td><td>-</td><td>1</td><td>3</td><td>3</td></tr>
<tr><td>C-20ME8X65.2</td><td>3</td><td>1</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>3</td><td>1</td><td>-</td><td>1</td><td>1</td><td>3</td></tr>
<tr><td>C-20ME8X65.3</td><td>3</td><td>1</td><td>1</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>3</td><td>1</td><td>-</td><td>1</td><td>3</td><td>3</td></tr>
<tr><td>C-20ME8X65.4</td><td>2</td><td>3</td><td>1</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>3</td><td>1</td><td>-</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>C-20ME8X65.5</td><td>3</td><td>1</td><td>1</td><td>-</td><td>-</td><td>1</td><td>1</td><td>1</td><td>3</td><td>1</td><td>-</td><td>1</td><td>2</td><td>3</td></tr>
</table>

1: Low   2: Medium   3: High

Scheme of SEE Question Paper

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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DISASTER MANAGEMENT			
Course Code	20CV8X67	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	3:0:0	**SEE Marks**	**50**
Total Hours	39	**Credits**	**03**

<u>**Course Learning Objectives:**</u>

1. Understand difference between Disaster, Hazard, Vulnerability, and Risk.
2. Know the Types, Trends, Causes, Consequences and Control of Disasters
2. Apprehend Disaster Management Cycle and Framework.
3. Know the Disaster Management in India
4. Appreciate Applications of Science and Technology for Disaster Management.

UNIT – I

Understanding Disasters: Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management.

Types, Trends, Causes, Consequences and Control of Disasters: Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters

15 Hours

UNIT – II

Disaster Management Cycle and Framework: Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR,YokohamaStretegy, Hyogo Framework of Action

Disaster Management in India: Disaster Profile of India – Mega Disasters of India and Lessons Learnt, Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national),Non-Government and Inter-Governmental Agencies

15 Hours

UNIT – III

Applications of Science and Technology for Disaster Management: Geo-informatics in Disaster Management (RS, GIS, GPS and RS) Disaster Communication System (Early Warning and Its Dissemination) Land Use Planning and Development Regulations Disaster Safe Designs and Constructions Structural and Non Structural Mitigation of Disasters S&T Institutions for Disaster Management in India

Case Studies: Study of Recent Disasters (at local, state and national level)

Preparation of Disaster Risk Management Plan of an Area or Sector,

Role of Engineers in Disaster Management

9 Hours

<u>**Course Outcomes:**</u>
After completion of this course the students will be able to
1. **Explain** Concepts, Types, Trends, Causes of Disasters
2. **Describe** Consequences and Control of Disasters
3. **Explain** Disaster Management Cycle and Framework:
4. **Explain** the lesson learnt from the disasters in India and **discuss** the financial mechanism, roles and responsibilities of Non-Government and Inter-Governmental Agencies for Disaster management
5. **Describe** the Applications of Science and Technology recent disasters, role of engineers for Disaster Management and **prepare** a report of Disaster Risk Management Plan.

Mapping of POs & COs:

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

Note:1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

REFERENCE BOOKS:

1. Coppola D P, 2007. Introduction to International Disaster Management, Elsevier Science (B/H), London.
2. https://nidm.gov.in/PDF/pubs/DM%20in%20India.pdf, Disaster Management in India, MHA, 2011.
3. World Disasters Report, 2018. International Federation of Red Cross and Red Crescent, Switzerland
4. Encyclopedia of disaster management, Vol I, II and III Disaster management policy and administration, S L Goyal, Deep & Deep, New Delhi, 2006
5. Encyclopedia of Disasters – Environmental Catastrophes and Human Tragedies, Vol. 1 & 2, Angus M. Gunn, Greenwood Press, 2008
6. Disasters in India Studies of grim reality, AnuKapur& others, 2005, 283 pages, Rawat Publishers, Jaipur.
7. Management of Natural Disasters in developing countries, H.N. Srivastava & G.D. Gupta, Daya Publishers, Delhi, 2006, 201 pages
8. Natural Disasters, David Alexander, Kluwer Academic London, 1999, 632 pages
9. Disaster Management Act 2005, Publisher by Govt. of India
10. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management, https://ndma.gov.in/en/publications.html#
11. NIDM Publications https://nidm.gov.in/books.asp
12. High Power Committee Report, 2001, J.C. Pant
13. Disaster Mitigation in Asia & Pacific, Asian Development Bank
14. National Disaster Management Policy, 2009, GoI
15. Disaster Preparedness Kit, 2017, American Red Cross,http://pchs.psd202.org/documents/mopsal/1539703875.pdf.
16. Subramanian R., "Disaster Management", 2018 Vikas Publishing House Pvt Ltd.

Note: 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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INTRODUCTION TO YOGA

Course Code:	20HU8X68	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 for - 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→ ↓ Course Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓ 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 2016.
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 (2016).
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	20HU8X70	**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→ ↓ Course Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓ 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

****

PRINCIPLES TO PHYSICAL EDUCATION			
Course Code	20HU8X71	**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→ ↓ Course Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓ 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	**20HU8X72**	**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 14-20) 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 (120) 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	**20HU8X74**	**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) 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)	13

(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, 2001

3. Langenscheidt German In 30 Days: Book + Cd Paperback, www.amazon.in, – 1 September 2011

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	20ME8X75	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 2016 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, 2015
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, 2008.
3. Dalby, Simon, et al. Achieving the Sustainable Development Goals: Global Governance Challenges. Routledge, 2019.
4. Sustainability: A Comprehensive Foundation by Tom Thesis and JonathanTomkin, Editors.

REFERENCE BOOKS:
1. Elliott, Jennifer. An introduction to sustainable development. Routledge, 2012.
2. Day, G.S., and P.J.H. Schoemaker (2011), 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 : 20ME/ 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 **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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WEB TECHNOLOGIES			
Course Code	20IS8X76	**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", 1stEdition, 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 **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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PROGRAMMING IN JAVA			
Course Code	**20CS8X77**	**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

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

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

Table-2: Mapping Levels of COs to POs / PSOs

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, 2007. (Chapters 2-11, 22-24, 29,30)

REFERENCE BOOKS:
1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education, 2008, ISBN:9788131720806
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-1720064.pdf*
2. NPTEL:*www.nptelvideos.com/java/java_video_lectures_tutorials.php*

SEE SCHEME:

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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DATA STRUCTURES AND ALGORITHMS			
Course Code	20CS8X78	**CIE Marks**	50
Teaching Hours/Week (L:T:P)	3:0:0	**SEE Marks**	50
Total Hours	39	**Credits**	03

<u>**Course Learning Objectives**</u>:

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.

<div align="center">

UNIT – I
</div>

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

<div align="center">

UNIT – II
</div>

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.

COs	\multicolumn{12}{c}{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	

Table-2: Mapping Levels of COs to POs / PSOs

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, 2006.
2. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", 2nd Edition, Pearson Education, 2007.

REFERENCE BOOKS:
1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd edition, Universities Press, 2014.
2. Seymour Lipschutz, "Data Structures, Schaum's Outlines", Revised 1st edition, McGraw Hill, 2014.
3. Thomas H. Cormen, Charles E.Leiserson, Ronal L. Rivest, Clifford Stein, "Introduction to Algorithms", 2nd Edition, PHI, 2006.

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 **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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ELECTRIC VEHICLE TECHNOLOGY			
Course Code	20EE8X79	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

<u>**Course Outcomes:**</u>

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
20EE8X .1	2	3										
20EE 8X .2	1	2	3									
20EE 8X .3	1	2	3									
20EE 8X .4	1	2	3									
20EE 8X .5	1	2	2									

1: Low 2: Medium 3: High

SEE QUESTION PAPER PATTERN:

- There will be **8** questions of **20** 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, 2003
2. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, M. Ehsani, Y. Gao, S.Gay and Ali Emadi, CRC Press, 2005

REFERENCE BOOKS:

1. Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Sheldon S. Williamson, Springer, 2013.
2. Modern Electric Vehicle Technology, C.C. Chan and K.T. Chau, OXFORD University, 2001
3. Hybrid Electric Vehicles Principles And Applications With Practical Perspectives, Chris Mi, M. Abul Masrur, David Wenzhong Gao, Wiley Publication, 2001

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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INTERNET OF THINGS – (IoT)			
Course Code	20CS8X80	**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 the IoT Definitions, Design aspects
2. Identify the IoT hardware and software requirements
3. Describe IoT logical and physical design concepts
4. Implement Arduino based IoT Projects
5. Implement Raspberry Pi based IoT Projects

UNIT – I

Introduction
Introduction to IoT : Definition and characteristics, Physical design, Logical design, Enabling technologies, Levels and deployment templates, Examples: Domain specific IoTs, IoT Design and System Engineering, Discuss IoT Requirements, Hardware & Software; Study of IoT sensors, Tagging and Tracking, Embedded Products; IoT Design, (U) SIM Card Technology, IoT Connectivity and Management, IoT Security & IoT Communication.
(Text Book-1:, Chapter 1 to 4)

15 Hours

UNIT – II

Design Concepts:
IoT Logical Design:
Data types, Data structures, Control flow, Functions, Modules, Packages, File Handling, Date and time operation, Classes, Python packages of IoT, IoT Physical Design, Basic building blocks, Raspberry Pi, Linux on Raspberry Pi, Interfaces, Programming on Raspberry Pi with Python, Arduino Based IoT Project Implementation, Arduino for Project development, Internet enabled Arduino powered garage door opener, Irrigation control system, Light controller Message, controller and cloud Services
(Text Book-1: Chapter 4,5,6 ,7)

15 Hours

UNIT – III

09 Hours

Raspberry Pi based IoT Project Implementation:
Raspberry Pi for Project Development: Raspberry Pi platform, GPIO, Establishment and setting, of Raspberry Pi software, LAMP project, Home temperature, monitoring system, Webcam and Raspberry Pi camera project
(Text Book-1: Chapter 10,11,12, 13

Course Outcomes:

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

1. Acquire the fundamental knowledge of IoT Definitions, Design aspects
2. Identify the IoT hardware and software requirements
3. Design IoT logical and physical architecture
4. Implement Arduino based IoT Projects
5. Implement Raspberry Pi based IoT Projects

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

Table-2: Mapping Levels of COs to POs / PSOs

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

TEXTBOOKS:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-On Approach,Vijay Madisetti", 2014.
2. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", 1st Edition, McGraw Hill, 2015.

REFERENCE BOOKS:

1. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs
2. Pethuru Raj and Anupama C. Raman,"The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
3. Jeeva Jose," Internet of Things", Khanna Publishing House, Delhi
4. Adrian McEwen," Designing the Internet of Things", Wiley
5. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
6. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media

E-Books / Online Resources:

1. Object-Oriented Analysis and Design with Applications, Grady Booch, Robert A. Maksimchuk, Michael W. Engel, Bobbi J. Young, Jim Conallen, Kelli A.
   Houston, Third Edition The Addison-Wesley Object Technology Series, 2007
2. Object-Oriented Modelling and Design with UML, James R Rumbaugh, Michael R. Blaha Pearson Education, 21-Nov-2011
3. Object-Oriented Analysis and Design, Ramnath, Sarnath, Dathan, Brahma, ISBN 978-1-84996-522-4,, Springer Publications, 2011.

MOOC:

1. https://www.coursera.org/specializations/internet-of-things
2. https://www.udemy.com/course/iot-internet-of-things-automation-using- raspberry-pi/
3. https://www.udemy.com/course/arduino-iot-cloud/

SEE SCHEME:

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.**

NATIONAL CADET CORPS: ORGANIZATION, FUNCTIONS AND CAPABILITIES

Course Code	20HU8X81	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	20EC8X82	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, 2009.
2. R. C. Gonzalez and R. E Woods, "**Digital Image Processing Using MATLAB**", Pearson education (Asia)/Prentice Hall of India, 2nd Edition, 2011.
3. 1.S. Jayaraman, S Esskairajan "**Digital Image Processing**", illustrated, Tata McGraw-Hill Education,2011.

NPTEL/ MOOC Link:

1. https://nptel.ac.in/courses/117105135/
2. https://nptel.ac.in/courses/117105079

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SOFTWARE ENGINEERING PRACTICES			
Course Code	20IS8X83	**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. Outline software engineering principles and activities involved in building large software programs.
2. Explain the importance of architectural decisions in designing the software.
3. Describe the process of Agile project development.
4. Recognize the importance of software testing and describe the intricacies involved in software evolution.
5. Identify several project planning and estimation techniques and explain the importance of software quality.

UNIT – I

Introduction: Need for Software Engineering, Professional Software Development, Software Engineering Ethics, Case Studies.
Software Processes: Models: Waterfall Model, Incremental Model and Spiral Model; Process activities.
Requirements Engineering: Functional and non-functional requirements, Requirements engineering processes, Requirements Elicitation and Analysis, Requirements specification, Software requirements document, Requirements validation & management.

15 Hours

UNIT – II

System Models: Context models, Interaction models, Structural models, Behavioral models.

T Architectural Design: Architectural design decisions. Architectural Views and patterns, Application architectures.

Design and implementation: Object oriented Design using UML.

Agile Software Development: Agile methods, Plan-driven and agile development, Extreme Programming, Agile project management.

15 Hours

UNIT – III

Project Management: Risk management, Teamwork.

Project Planning: Software pricing, Plan-driven development, Project Scheduling

Quality Management: Software quality, Reviews and inspections, Software measurement and metrics, Software standards.

9 Hours

Course Outcomes:

Students will be able to:

Sl. No.	Course Outcomes
1.	Recognise the basics of software system, component, process and Software Requirement Specification to meet desired needs within realistic constraints and outline the professional and ethical responsibility
2.	Describe the waterfall, incremental and iterative models and architectural design in implementing the software
3.	Make use of the techniques, skills, modern engineering design tools and agile methods necessary for engineering practice.
4.	Describe the methods for maintaining software system.
5.	Discuss project planning and management and illustrate the quality of software products

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓ 1	2
↓ Course Outcomes													1	2
IS2504-1.1		3	1					2					1	2
IS2504-1.2	1	3	1										1	2
IS2504-1.3	1	1	3										2	3
IS2504-1.4	1	3	2										1	2
IS2504-1.5	1	2	2										1	2

1: Low 2: Medium 3: High

TEXTBOOK:

1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education, 2012. 82Syllabus of III & IV Semester B.E. / Computer Science &Engg.

REFERENCE BOOKS:

1. Roger S. Pressman: "Software Engineering-A Practitioners approach", 7th Edition,Tata McGraw Hill, 2017.
2. Pankaj Jalote: "An Integrated Approach to Software Engineering", Wiley, India, 2010.

E-RESOURCES

1. http://agilemanifesto.org/
2. http://www.jamesshore.com/Agile-Book/
3. https://www.mooc-list.com/course/uml-class-diagrams-software-engineering-edx
4. https://www.mooc-list.com/course/enterprise-software-lifecycle-management-edx

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**fullquestions from **Unit-I & Unit – II** and **1**fullquestion from **Unit– III.**

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INTRODUCTION TO CYBER SECURITY			
Course Code	20IS8X84	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:

1. Define the area of cybercrime and forensics.
2. Explain the motive and causes for cybercrime, detection and handling.
3. Investigate Areas affected by cybercrime.
4. Illustrate tools used in cyber forensic

UNIT – I

Introduction to Cybercrime: Cybercrime- Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cyber Crimes. **[T1: 1.1-1.5]**

Cyberoffenses: How Criminals Plan Them: How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing. **[T1: 2.1-2.8].**

Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops. **[T1:3.1-3.12]**

14 Hours

UNIT – II

Tools and methods used in Cybercrime:
Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan-horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. **[T1: 4.1-4.12]**

Phishing and Identity Theft Introduction to Phishing, Identity Theft (ID Theft). **[T1: 5.1-5.3]**

12 Hours

UNIT – III

UNDERSTANDING COMPUTER FORENSICS

Introduction, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics. **[T1: 7.1-7.19]**

13 Hours

Course Outcomes:

Students will be able to:

Sl. No.	Course Outcome
IS2503.1	Comprehend the Cybercrime and its origin
IS2503.2	Analyse the cybercrimes in mobile and wireless devices
IS2503.3	Apply tools and methods used in Cyber crimes
IS2503.4	Analyse Phishing and and ID Theft
IS2503.5	Comprehend Digital Forensics

Program Outcomes→ ↓ Course Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓ 1	2
IS2503-1.1	2					1		3						
IS2503-1.2		3		1		2			2					
IS2503-1.3		3	2										2	3
IS2503-1.4	2					2								
IS2503-1.5								3						

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

TEXTBOOKS:

1. SunitBelapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81-265-21791, Publish Date 2013.

REFERENCE BOOKS:

1. Thomas J. Mowbray, "Cyber security: Managing Systems, Conducting Testing, and Investigating Intrusions", Copyright © 2014 by John Wiley & Sons, Inc, ISBN: 978 -1-118 -84965 -1.
2. James Graham, Ryan Olson, Rick Howard, "Cyber Security Essentials", CRC Press, 15-Dec 2010. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw-Hill.

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**fullquestions from **Unit-I & Unit – II** and **1**fullquestion from **Unit– III.**

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SPACETECHNOLOGYANDAPPLICATIONS			
Course Code	20EC8X85	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 the general laws governing satellite orbits and its parameters.
2. Discuss effect of space environment on satellite signal propagation.
3. Illustrate various segments employed in satellite and ground station.
4. Calculate the uplink/downlink sub system characteristics.
5. Know the effects on the EM waves in propagation through space.
6. Explain the satellite launch in the space and their applications in remote sensing.
7. Discussthethedifferentcommunicationsystemsusedforsatelliteaccess.
8. Summarise Advanced space systems for mobile communication, VSAT, GPS.

UNIT – I

Satellite communications: Introduction, Kepler's laws, definitions, orbital element, apogeeandperigeeheights, orbit perturbations, inclined orbits.

Space environment: Earth's Atmosphere, Ionosphere and Meteorological effects on space systems, propagation of signal, Transmission losses in space environment.

Satellite Technology: Space segment, Ground segment, Quality and Reliability, Satellite Communication systems, Antennas.

15 Hours

UNIT – II

LaunchVehicles: Working,stages,Fuel,payloadprotection,Navigation,guidanceandcontrol,Reliability,launchingi ntoouter space and launch bases. Types of launch vehicles.

Space Applications: Digital DBS TV, DBS-TV System Design, Master Control Station and Uplink Antennas. Introduction, Radio and Satellite Navigation,

Remote Sensing: Introduction to Remote Sensing, Concepts and Applications of satellite Remote sensing.

14 Hours

UNIT – III

Satellite Access: Introduction, Single Access, Pre-assigned FDMA, Demand-Assigned FDMA, Spade system.

Advancedspacesystems: Satellitemobileservices,VSAT,Radarsat,orbitalcommunication**.**GlobalPositioning Satellite System (GPS).

10 Hours

Course Outcomes:

At the end of the course student will be able to
1. Discuss the fundamental principles of Satellite communication systems.
2. Discuss the Propagation impairments of satellite link.
3. Explain various segments employed in satellite and ground station.
4. Discuss the satellite launch mechanism and roll of those satellite in remote sensing.
5. Explain the different communication systems used for satellite access and list the recent satellites that have been launched for mobile communication, GPS.

Course Outcomes:

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

High Assessment Details (both CIE and SEE)
TheweightageofContinuousInternalEvaluation(CIE)is50%andforSemesterEndExam(SEE)is50%.The student must obtain minimum of 20 marks out of 50 in CIE and 20 marks out of 50 in SEE and 40%intotaltoobtainapassgrade.Semester End Exam(SEE)is conducted for 100 marks (3Hoursduration). Based on this grading will be awarded.

TEXTBOOKS:
T1. Dennis Roddy, **"Satellite Communications"**, McGraw Hill 1996.
T2.TimothyPratt,**"SatelliteCommunications"**,WileyIndiaLtd,2006.
T3.KRamamurthy,**"RocketPropulsion"**,McMillanPublishersIndiaLtd,2010.

REFERENCE BOOKS:
R1. George Joseph, **"Fundamentals of Remote Sensing"**, Universities press, India 2003.
R2.BC Pande, **"Remote sensing and Applications"**, VIVA Books pvtltd, 2009.
R3. Meynart Roland, **"Sensors systems and next generation satellites"**, SPIE Publication.
R4.Thyagarajan ,**"Space Environment"**, ISRO Hand Book Publication.

E-Books / MOOC:
    https://nptel.ac.in/courses/101106046

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INTRODUCTION TO YAKSHAGANA			
Course Code	20HU8X86	**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

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MARKETING MANAGEMENT			
Course Code	20ME8X88	**CIE Marks**	50
Teaching Hours/Week (L:T:P)	3:0:0	**SEE Marks**	50
Total Hours	39	**Credits**	03

<u>**Course Learning Objectives:**</u>

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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