

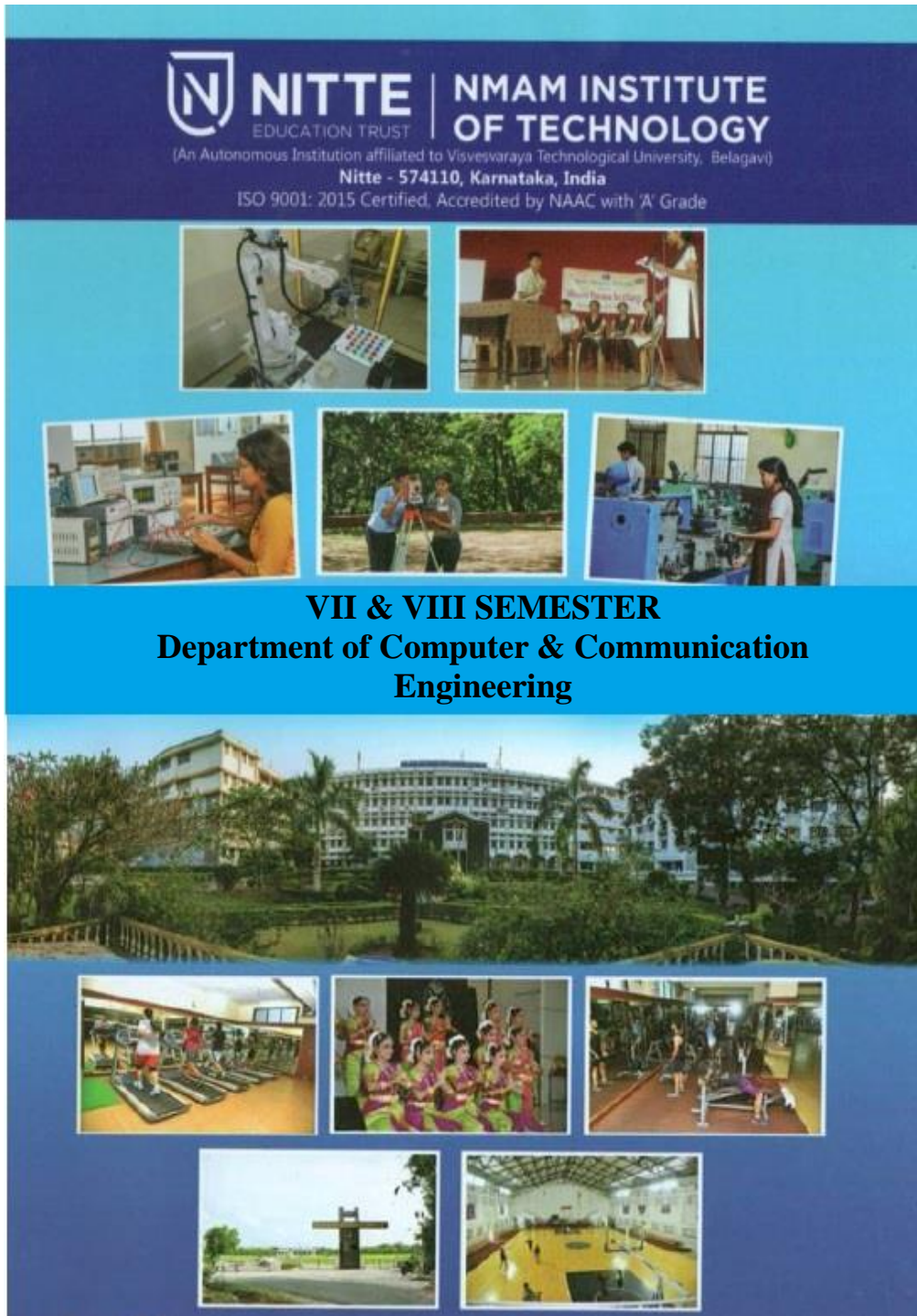


College Calendar 2023-24

Department of Computer & Communication Engineering



Syllabus of 4th Year



College Calendar 2023-24

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

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

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

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

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



(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)





(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

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. Niranjana 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	1 st 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
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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
	Seminar on Current Topic	(VI – 2, VII-2, VIII-12) 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, mini projects, tutorials etc. : 10 marks
- ii) Mid-semester Examination : 40 marks

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

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

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

8.6 Passing standards

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

- i) Project work evaluation: The evaluation of CIE of the project work shall be based on the progress of the student in the work assigned by the project supervisor, periodically evaluated by him/her together with a Department committee constituted for this purpose. Seminar presentation, project report and final oral examination conducted by project evaluation committee at the department level shall form the SEE of the project work.
- ii) In the case of other requirements, such as, seminar, industrial internship, field work, comprehensive viva voce, if any, the assessment shall be made as laid down by the Academic council.
- iii) **There shall be no re-examination for any course in the credit system.**

However, students

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

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

8.7 i) **Grade point scale for absolute grading**

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

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

8.8 **Earning of Credits**

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

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

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

8.10 Grade Card: Each student shall be issued a Grade Card (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.**

8.11 The Make Up Examination

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

- a) 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.

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

CGPA is computed as follows:

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

10. COMMUNICATION OF GRADES

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

$$\text{Percentage} = (\text{GPA} - 0.75) \times 10$$

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 \geq 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 choose 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 \geq 5.00 at the end of the Programme

- (a) Students, who have completed all the courses of the Programme but not having a CGPA \geq 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 \geq 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 \geq 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 \geq 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.

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	
Parents must have Beedi Id. Card	Beedi Scholarship	Online application	scholarships.gov.in or nsp.gov.in

- 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.**
- 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 & COMMUNICATION ENGINEERING

VII & VIII SEMESTER

**With
Scheme of Teaching
& Examination**

NMAM Institute of Technology, Nitte
B.E. in Computer and Communication Engineering
Scheme of Teaching and Examination 2023-24
VI SEMESTER

SN	Course	Course Code	Course Title	Teaching Department	Teaching Hours / Week				Examination			Credits	
					Lecture	Tutorial	Practical / Drawing	Self-Study Component	Duration	CIE Marks	SEE Marks		Total Marks
					L	T	P	S					
1	HSMC	20HU701	Engineering Management	HU	3	-	-	-	3	50	50	100	3
2	PC	20CC702	Multimedia Communication	CCE	3	2	-	-	3	50	50	100	4
3	PC	20CC703	Software Defined Networking	CCE	3	-	-	-	3	50	50	100	3
4	PE	20CC71X	Elective-IV	CCE	3	-	-	-	3	50	50	100	3
5	PE	20CC72X	Elective – V	CCE	3	-	-	-	3	50	50	100	3
6	OE	20xy71X	Open Elective – I	ANY	3	-	-	-	3	50	50	5	3
7	PC	20CC704	Project Phase I	CCE	-	-	6	-	1	50	-	50	3
8		20CC705	Seminar on Special Topic	CCE	-	-	2	-	1	50	-	50	1
TOTAL					18	-	8	-	-	400	300	700	22

Elective IV		Elective V	
20CC711	Introduction to Deep Learning	20CC721	Network Flow Algorithms
20CC712	Pattern Recognition	20CC722	Internet Routing Design Principles
20CC713	High Performance Computing	20CC723	Ethical Hacking
20CC714	Embedded System Design	20CC724	Digital Watermarking and Stenography
20CC715	Multicore Architecture And Programming	20CC725	Autonomous Systems

NMAM Institute of Technology, Nitte
B.E. in Computer and Communication Engineering
Scheme of Teaching and Examination 2023-24

VIII SEMESTER

SN	Course Category	Course Code	Course Title	Teaching Department	Teaching Hours / Week				Examination			Credits	
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration	CIE Marks	SEE Marks		Total Marks
					L	T	P	S					
1	PE	20CC86X	Elective – VI	CCE	3	0	0		03	50	50	100	3
2	OE	20xyXXX	Open Elective – II	CCE	3	0	0		03	50	50	100	3
3	PC	20CC801	Project Phase-II	CCE	0	0	24		03	100	100	200	12
4	IN	20CC802	Internship Reporting	CCE	-	6	-		-	50	50	100	3
TOTAL					15	-	6	-	-	500	300	800	22

Elective VI	
20CC811	Big Data Analytics
20CC812	Storage Area Networks
20CC813	Intrusion Detection Systems
20CC814	Web Engineering
20CC815	Digital forensics for networks

ENGINEERING MANAGEMENT			
Course Code	20HU701	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
Management: Meaning – Functions of Management Forecasting – Meaning, Methods of Forecasting (Qualitative methods and Quantitative methods – simple moving average method, weighted moving average method, exponential smoothing method, simple regression model) Break Even Analysis – Meaning of Break-Even Point, Margin of Safety and estimation Organizing: Meaning, Legal Forms of Organization – Sole Proprietorship, Partnership, Corporation/Company, Co-operatives – Meaning and Features only)			15
UNIT – II			
Project Planning Tools – Gantt (Bar) Charts, Network Analysis – PERT and CPM - Crashing the Project completion duration using network analysis. Depreciation – Types and Causes, Computing Depreciation (using straight line method only) – Estimation of Sunk Cost.			15
UNIT – III			
Project Evaluation Techniques: Interest Rate Calculations, Simple Interest, Compound Interest, Effective Rate of Interest, Payback Time, Present Worth, Future Worth, Annual Worth Calculations.			09
Course Outcomes: Upon completion of this course, students will be able to: <ol style="list-style-type: none"> 1. Demonstrate the basic management skills required for a professional 2. Demonstrate the management of engineering technology, project evaluation and selection. 3. Practice social responsibilities in real life. 			
TEXTBOOKS <ol style="list-style-type: none"> 1. Managing Engineering and Technology, 3rd Edition,- Daniel L. Babcock, Lucy C Morse. 2. Management in Engineering – Principles and Practice, Second Edition, - Gail, Freeman Bell, James Balkwill; Prentice Hall of India Pvt. Ltd., New Delhi – 110001. 3. Essentials of Management, Fifth Edition, - Harold Koontz, Heinz Weihrich; Tata MacGraw Hill Edition, New Delhi. 4. Engineering Economics, 4th Edition, - James L. Riggs, David D. Bedworth, Sabah U. Randhawa; Tata McGraw Hill Edition. 5. Industrial and Business Management, - Martand T Telsang; Sulthan Chand & Company Ltd., New Delhi – 110055. 			

REFERENCEBOOKS:

1. Fundamentals of Financial Management, - Prasanna Chandra; Tata McGraw Hill Publishing Company Ltd, New Delhi.
2. Operation Research, - S. D. Sharma.
3. Operation Research – An Introduction, - Hamdy A Taha; Pearson Prentice Hall.
4. Organizational Behaviour, - Stephen P Robbins; Prentice Hall, India.
5. Organizational Behaviour, - Fred Luthans; McGraw Hill International Edition.
6. Financial Management – Text, Problems & Cases, - M Y Khan, P K Jain; Tata McGraw Hill.

MULTIMEDIA COMMUNICATION			
Course Code	20CC702	CIE Marks	50
Number of Contact Hours/Week	3:2:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
<u>Course Learning Objectives</u>			
This Course will enable students to			
<ol style="list-style-type: none"> 1. Outline the multimedia communication for communication model and standardization framework 2. To discuss multimedia Standardization for requirements in the communication systems. 3. To understand the basics of application layers in multimedia communication system. 4. To illustrate the middleware layer for multimedia communication 5. To know the role of Network layer for Quality of Service and different types networks available for multimedia communication 			
UNIT – I			Contact Hours
Introduction to Multimedia Communications: Introduction, Human communication model, Evolution and convergence, Technology framework, Standardization framework.			15
Framework for Multimedia Standardization: Introduction, Standardization activities Standardization processes on multimedia communications, ITU-T mediacom2004 framework for multimedia, ISO/IEC MPEG-21 multimedia framework, IETF multimedia Internet standards.			
UNIT – II			
Application Layer: Introduction, ITU applications, MPEG applications, Mobile servers and applications, Universal Multimedia Access			15
Middleware Layer: Introduction to middleware for multimedia, Media coding, Media Streaming, Middleware Technologies for Multimedia Networks			
UNIT – III			
Network Layer: Network Traffic Analysis, Quality of Service (QoS) in Network Multimedia Systems, Generic Networks, Access Broadband Networks, Core Broadband Networks, Content Delivery Networks.			9

Course Outcomes:

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

1. Appreciate meaning and use of Multimedia networks, Evolution and convergence
2. Understand standards used in multimedia communication
3. Able to Understand the application layer in multimedia communication
4. Able to Understand the Middleware layer in multimedia communication
5. Able to Understand the Network layer in multimedia communication

TEXTBOOK:

1. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic: Introduction to Multimedia Communications - Applications, Middleware, Networking, Wiley India, 2006.

REFERENCEBOOKS:

1. Fred Halsall: Multimedia Communications - Applications, Networks, Protocols, and Standards, Pearson, 2001
2. Nalin K Sharad: Multimedia information Networking, PHI, 2002.
3. Ralf Steinmetz, Klara Narstedt: Multimedia Fundamentals: Volume 1- Media Coding and Content Processing, 2nd Edition, Pearson, 2003.
4. Prabhat K. Andleigh, Kiran Thakrar: Multimedia Systems Design, PHI, 2003.

Mapping of PO's & CO's:

PO\PSO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO														
1	3	2	1	-	-	-	-	-	-	-	-	1	1	-
2	3	2	1	-	-	-	-	-	-	-	-	-	1	-
3	3	2	1	-	-	-	-	-	-	-	-	-	1	-
4	3	2	1	-	-	-	-	-	-	-	-	-	1	-
5	3	2	1	-	-	-	-	-	-	-	-	-	1	-

SOFTWARE DEFINED NETWORKS

Course Code	20CC703	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03

Credits – 3

Course Learning Objectives

This Course will enable students to

1. Recognize the fundamentals and characteristics of Software Defined Networks
2. Understand the basics of Software Defined Networks Operations and Data flow
3. Discriminate different Software Defined Network Operations and Data Flow
4. Analyze alternative definitions of Software Defined Networks
5. Apply different Software Defined Network Operations in real world problem

UNIT – I	Contact Hours
<p>Introduction to SDN Understanding the SDN, Understanding the SDN technology, Control Plane, Data Plane, Moving information between planes, separation of the control and data planes, Distributed control planes, Load Balancing, Creating the MPLS Overlay, Centralized control planes. Textbook 1: Chapter 1,2 Need for SDN Evaluation of Switches and Control planes, SDN Implications, Data center Needs, Forerunner of SDN, Software Defined Networks is Born, Sustain SDN interoperability, Open source contribution Textbook 2: Chapter 2,3</p>	14
UNIT – II	
<p>Working of SDN Fundamental Characteristics of SDN, SDN Operations, SDN Devices, SDN Controllers, SDN Applications, Alternate SDN methods. The Open Flow Specifications Open Flow Overview, Open Flow Basics, Open Flow 1.0 additions, Open Flow 1.1 additions, Open Flow 1.2 additions, Open Flow 1.3 additions, Open Flow limitations. Textbook 2: Chapter 4,5</p>	15
UNIT – III	
<p>Data Center Data centers definition, Data centers demand, tunneling technologies for Data centers Path technologies in data centers, Ethernet fabrics in Data centers, SDN use case in Data centers. Textbook 2: Chapter 7</p>	10
<p>Course Outcomes: Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Recognize the fundamentals and characteristics of Software Defined Networks 2. Understand the basics of Software Defined Networks Operations and Data flow 3. Discriminate different Software Defined Network Operations and Data Flow 4. Analyze alternative definitions of Software Defined Networks 5. Apply different Software Defined Network Operations in real world problem 	
<p>TEXTBOOKS:</p> <ol style="list-style-type: none"> 1. Software Defined Networking by Thomas D Nadeau and Ken Gray. 2. Software Define Networks, A Comprehensive Approach, Paul Goransson, Chuck Black. MK Publications. 	
<p>REFERENCEBOOKS:</p> <ol style="list-style-type: none"> 1. Software Defined Networking for Dummies brought you by cisco, Brian Underdahl and Gary Kinghorn 2. 	

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓		
													1	2	
↓ Course Outcomes															
20CC703.1	3	-	2	-	-	-	-	-	-	-	-	1	3	-	
20CC703.2	3	-	2	-	-	-	-	-	-	-	-	1	3	-	
20CC703.3	3	-	2	-	-	-	-	-	-	-	-	1	3	-	
20CC703.4	3	3	2	-	-	-	-	-	-	-	-	1	3	-	
20CC703.5	3	3	2	-	-	-	-	-	-	-	-	1	3	-	

1: Low 2: Medium 3: High

INTRODUCTION TO DEEP LEARNING			
Course Code	20CC711	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
Artificial Neural Networks- The Neuron-Expressing Linear Perceptrons as Neurons-Feed-Forward Neural Networks- Linear Neurons and Their Limitations –Sigmoid – Tanh - and ReLU Neurons -Softmax Output Layers - Training Feed-Forward Neural Networks-Gradient Descent-Delta Rule and Learning Rates- Gradient Descent with Sigmoidal Neurons- The Backpropagation Algorithm-Stochastic and Minibatch Gradient Descent - Test Sets - Validation Sets - and Overfitting- Preventing Overfitting in Deep Neural Networks - Implementing Neural Networks in TensorFlow.			15
UNIT – II			
Convolutional Neural Networks(CNN) - Architecture -Accelerating Training with Batch Normalization- Building a Convolutional Network using TensorFlow- Visualizing Learning in Convolutional Networks - Embedding and Representation Learning -Autoencoder Architecture-Implementing an Autoencoder in TensorFlow – DenoisingSparsity in Autoencoders Models for Sequence Analysis - Recurrent Neural Networks- Vanishing GradientsLong Short-Term Memory (LSTM) UNITS- TensorFlow Primitives for RNN Models-Augmenting Recurrent Networks with Attention			15
UNIT – III			
Local Minima in the Error Surfaces of Deep Networks- Model Identifiability- Spurious Local Minima in Deep Networks- Flat Regions in the Error Surface - Momentum-Based Optimization - Learning Rate Adaptation.			09

Course Outcomes:

1. Able to understand the mathematics behind functioning of artificial neural networks
2. Able to analyze the given dataset for designing a neural network based solution
3. Able to carry out design and implementation of deep learning models for signal/image processing applications
4. Able to design and deploy simple Tensor Flow-based deep learning solutions to classification problems
5. Able to understand Deep Network for optimization.

TEXTBOOKS:

1. Nikhil Buduma, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithm”, O’Reilly, 2017.
2. Ian Goodfellow, YoshuaBengio and Aaron Courville, “Deep Learning”, MIT Press, 2016.

REFERENCEBOOKS:

1. AurélienGéron, “Hands-On Machine Learning with Scikit- Learn and TensorFlow”, O’Reilly, 2017.
2. Nikhil Ketkar, “Deep Learning with Python: A Hands-on Introduction”, Apress, 2017.

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

PATTERN RECOGNITION			
Course Code	20CC712	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
<p>Introduction: Machine Perception, Pattern Recognition systems, Design cycle, learning and adaptation 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. 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.</p>			15
UNIT – II			
<p>Nonparametric Techniques: Introduction, Density Estimation, Parzen Windows, kn-nearest neighbour estimation, nearest neighbour rule, metrics and nearest-neighbour classification, fuzzy classification, reduced coulomb energy, approximations by series expansions. 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.</p>			15
UNIT – III			
<p>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.</p>			09
<p><u>Course Outcomes:</u> Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 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. 			

TEXTBOOKS

1. Richard O. Duda, Peter E. Hart and David G Stork,” Pattern Classification”, John Wiley & Sons, Inc.2nd Ed. 2001.

Robert Schalkoff, “Pattern Recognition: Statistical, Structural and Neural Approaches”, John Wiley & Sons, Inc.1992.

REFERENCEBOOKS:

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.

HIGH PERFORMANCE COMPUTING			
Course Code	20CC713	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
<p>Introduction to GPU computing: Why GPU, evolution of GPU pipeline and general purpose computation on GPU, GPU architecture case studies: NVIDIA G80, GT200, Fermi, AMD Radeon, AMD Fusion APU etc.</p> <p>Execution Model: Features of CUDA and OpenCL, Comparison of CUDA and OpenCL, Thread organization, Kernel, error handling, and execution in CUDA and OpenCL</p>			16
UNIT - II			
<p>Programming Model: CUDA Introduction, basics of CUDA C, Complete CUDA structure, basic details of API and libraries, OpenCL overview, OpenCL basic specification, OpenCL C language, Vectorization.</p> <p>Memory Model: Introduction to memory model and GPU interaction with CPU, Memory model of CUDA and OpenCL, Memory hierarchy (local/register, shared and global) and optimizations.</p>			15
UNIT - III			
<p>Tools and programming: Introduction to installation and compilation process, usage of tools, profilers and debuggers. CUDA by Examples and OpenCL by Examples, Future Directions.</p>			08
Course Outcomes:			
<p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the need of graphical processing unit 2. Write simple CUDA programs 			
TEXTBOOKS:			
<ol style="list-style-type: none"> 1. David B Kirk and Wen-Mei W. Hwu, Programming Massively Parallel Processors: A Hands-on Approach, 2010. 2. Jason Sanders and Edward Kandrot, CUDA by Example: An Introduction to General-Purpose GPU Programming, 2010. 			
REFERENCE BOOKS:			
<ol style="list-style-type: none"> 1. T. Mattson, et al. Patterns of Parallel Programming, Addison Wesley, 2005 2. NVIDIA CUDA Programming Guide V3.0, NVIDIA 3. Benedict R. Gaster, Timothy G. Mattson and James Fung, OpenCL Programming Guide by Aaftab Munshi, 2011. 4. Benedict Gaster, David R. Kaeli, Lee Howes and Perhaad Mistry, Heterogeneous Computing with OpenCL, 2011. 5. GPU Gems 3, H. Nguyen (ed.), Addison Wesley, 2007. 6. GPU Gems 2, M. Pharr (ed.), Addison Wesley, 2005. 			

EMBEDDED SYSTEMS DESIGN			
Course Code	20CC714	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
<p>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.</p> <p>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.</p>			15
UNIT – II			
<p>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</p>			15
UNIT - III			
<p>Intel ATOM Processor Architecture, Platform architecture and Micro architecture details, 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.</p>			09
<p>Course Outcomes: Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 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. 			
<p>TEXTBOOKS:</p> <ol style="list-style-type: none"> 1. Frank Vahid and Tony Givargis, “Embedded Systems Design – A unified Hardware/Software Introduction”, John Wiley, 2002. 2. David E. Simon, “An Embedded Software Primer”, Pearson Education Asia, First Indian Reprint 2000. 3. Kenneth Ayala, “8051 Microcontroller Architecture, Programming and Applications”, West publishing, 1991 			

REFERENCEBOOKS:

1. Lori Matassa and Max Domeika, “ Break away with Intel Atom Processors: A guide to Architecture Migration”, Intel Press, 2010
2. Peter Barry, Patrik Crowley, “Modern Embedded Computing”, Morgan Kaufmann Publishers, ISBN : 978-0-12-391490-3 2012.

NETWORK FLOW ALGORITHMS			
Course Code	20CC721	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
<u>Course Learning Objectives:</u>			
This Course will enable students to			
<ol style="list-style-type: none"> 1. Understand algorithmic aspects and network flow problems. 2. Explore different shortest path algorithms. 3. Evaluate flow algorithms and their applications towards networks. 4. Explain various flow algorithms based on cost as an evaluating parameter. 5. Evaluate algorithms designed to deal multiple networks. 			
UNIT - I			Contact Hours
Introduction: Network Flow Problems, Network Representations, Network Transformations, Complexity Analysis, Developing Polynomial Time Algorithms, Search Algorithms, Flow Decomposition Algorithms. Shortest Path Algorithms: Shortest Paths: Label Setting Algorithms – Dijkstra’s Algorithm, Dial’s Implementation, Heap Implementation, Radix Heap Implementation. Shortest Paths: Label Correcting Algorithms – Generic Label Correcting Algorithms, Special Implementations of the Modified Label Correcting Algorithm, Detecting Negative Cycles, All Pairs Shortest Path Problem, Minimum Cost–to–Time Ratio Cycle Problem.			15
UNIT - II			
Maximum and Minimum Flow Algorithms Maximum Flows: Generic Augmenting Path Algorithm, Labeling Algorithm and Max-Flow Min–Cut Theorem, Capacity Scaling Algorithm, Distance Labels and Layered Networks, Generic Pre Flow Push Algorithm, FIFO Pre Flow Push Algorithm, Flows in UNIT Capacity Networks, Flows in Bipartite Networks, Flows in Planar Undirected Networks. Minimum Cost Flows: Optimality Conditions, Cycle Canceling Algorithm and the Integrity Property, Successive Shortest Path Algorithm, Primal–Dual Algorithm, Out–of Kilter Algorithm, Capacity Scaling Algorithm, Cost Scaling Algorithm, Minimum Mean Cycle Canceling Algorithm.			14
UNIT - III			
Trees and Forest: Minimum Spanning Trees, Kruskal’s Algorithm, Prim’s Algorithm, Sollin’s Algorithm, Convex Cost Flows, Pseudo Polynomial Time Algorithm, Polynomial Time Algorithm Generalized Flows, Augmented Forest Structures, Determining Potentials and Flows for an Augmented Forest Structure, Generalized Network Simplex Algorithm.			10
<u>Course Outcomes:</u>			
Upon completion of this course, students will be able to:			
<ol style="list-style-type: none"> 1. Illustrate algorithmic aspects and network flow problems. 2. Demonstrate working of different shortest path algorithms 3. Evaluate flow algorithms and their applications towards networks 4. Analyze various flow algorithms based on cost as an evaluating parameter 5. Evaluate algorithms designed to deal multiple networks 			

<p>TEXTBOOKS:</p> <ol style="list-style-type: none"> 1. Ravindra K. Ahuja, Thomas L. Magnanti, James B. Orlin, “Network Flows – Theory, Algorithms and Applications”, 1st Edition, Prentice Hall, 1993. 2. Mokhtar S. Bazaraa, John J. Jarvis, Hanif D. Sherali, “Linear Programming and Network Flows”, 4th Edition, John Wiley & Sons, 2009. 3. Gunther Ruhe, Kluwer, “Algorithmic Aspects of Flows in Networks”, Academic Publishers Group, 1991. 	
<p>REFERENCEBOOKS:</p> <ol style="list-style-type: none"> 1. Michael W. Lucas, “Network Flow Analysis”, No Starch Press, 2010. 2. Alexander Engau, Vdm Verlag Dr. Muller, “Semi-Simultaneous Flows in Multiple Networks”, Aktiengesellschaft & Co. Kg, 2008. 3. Wai-kai Che, “Theory of Nets: Flows In Networks”, John Wiley & Sons, 1990. 4. Ulrich Derigs, “Programming in Networks and Graphs: On the Combinatorial Background and Near-Equivalence of Network Flow and Matching Algorithms”, 1st Edition, Springer, 1988. 5. Ford L. R. Jr., Robert G. Bland, Fulkerson D. R, “Flows In Networks”, Princeton University Press, 2010. 	

ETHICAL HACKING			
Course Code	20CC723	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
<p>Introduction Introduction to ethical hacking, types of ethical hacking, hacking methodology and terminology, concept of networking, TCP/IP protocol stack, IP addressing and routing, TCP & UDP, IP subnetting, routing protocol, IP version, routing examples, Nessus installation: Process & operation details.</p> <p>Software exploitation Metasploit Exploiting system software, Metasploit social engineering works, Metasploit social Engineering works, MITM attack, Basic concept of cryptography, private key cryptography, public key cryptography, cryptographic hash function.</p>			15
UNIT – II			
<p>Hacking types and Daniel of service Digital signature & certificate, applications, steganography, biometrics, network based attacks, DNS and Email security, side channel attacks, password cracking, phishing attack, maloware, wifi hacking, Dos and DDos attack, DoS/DDos Attack Techniques, DoS/DDos Attack Tools, DoS/DDos Protection Tools.</p>			15

UNIT – III	
<p>Hardware hacking and SQL injection Elements of hardware security, physical unclonable function, hardware Trojon, web application vulnerability scanning, SQL injection authentication bypass, SQL injection error based, QL injection error based from web application, SQLMAP, cross site scripting, file upload vulnerability, NMAP tool, network analysis using wireshark.</p>	09
<p>Course Outcomes: Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Conduct online intelligence gathering for individual network security. 2. Scan & enumerate target systems in network. 3. Protect files/systems by open password-protected files. 4. Monitor keystrokes and user activity for network security 5. Aware of common phishing techniques. 	
<p>TEXTBOOKS:</p> <ol style="list-style-type: none"> 1. Cyber Crime and Law Enforcement- V. D. Dudeja, Commonwealth Publishers. 2. Introduction to Computer network and Cybersecurity- C. H Wu and J.D. Irwin. 	
<p>REFERENCEBOOKS:</p> <ol style="list-style-type: none"> 1. Cryptography and Network Security: Principles and Practice- W. Stallings. 2. Hacking: The Art of Exploitation-Jon Erickson 	

BIG DATA ANALYTICS			
Course Code	20CC811	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT - I			Contact Hours
<p>Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, Data environment versus big data environment; Big data technologies and Databases: Introduction to NoSQL, Uses, Features and Types, Need, Advantages, Disadvantages and Application of NoSQL, Overview of NewSQL, Comparing SQL, NoSQL and NewSQL, Introduction to MongoDB and its needs, Characteristics of MongoDB, Introduction of apache cassandra and its needs, Characteristics of cassandra</p> <p>Hadoop foundation for analytics: History, Needs, Features, Key advantage and Versions</p>			16

of Hadoop, Essential of Hadoop ecosystems, RDBMS versus Hadoop, Key aspects and Components of Hadoop, Hadoop architectures.	
UNIT - II	
Hadoop MapReduce and YARN framework: Introduction to MapReduce, Processing data with Hadoop using MapReduce, Introduction to YARN, Components, Need and Challenges of YARN, Dissecting YARN, MapReduce application, Data serialization and Working with common serialization formats, Big data serialization formats; Big data with Hive and Pig: Overview of hive and its architecture, Hive data types and File format, Hive query language (HQL), Introduction to Pig, pig latin overview, Data types in Pig and Running Pig.	15
UNIT – III	
Big data analytics: Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment.	08
Course Outcomes: Upon completion of this course, students will be able to: 1. Identify the issues and challenges related to Big Data. 2. Choose and apply Big Data technologies and tools in solving real life Big Data problem. 3. Design MapReduce architecture for Big Data problem. 4. Write scripts using Pig and Hive to implement Big Data problem 5. Derive different Analytics from the Big Data problem	
TEXTBOOKS: Seema Acharya, Subhashini Chellappan ,“Big Data and Analytics”, Wiley,2017. Alex Holmes,“Big Data Black Book”, Dreamtech,2015.	
REFERENCE BOOKS: Minelli, Chambers, Dhiray,“Big Data Big Analytics”, Wiley,2013. Bart Baesens , “Analytics in a Big Data World”, Wiley,2014. Boris Lublinsky, Kevin T. Smith , “Hadoop Solutions”, Wrox, First Edition,2013 Chuck Lam, “Hadoop in Action”, Dreamtech,2011.	

ROBOTICS			
Course Code	20CC812	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
<p>Introduction to Robotics: Types and components of a robot, Classification of robots, closed-loop and openloop control systems. Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.</p> <p>Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics</p> <p>Dynamic Modelling: Equations of motion: Euler-Lagrange formulation Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc.</p>			15
UNIT – II			
<p>Vision System: Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity/Affine/Projective transformations; Vision applications in robotics</p> <p>Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID; Non-linear and advanced controls.</p> <p>Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.</p>			16
UNIT - III			
<p>Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.</p>			08
<p>Course Outcomes:</p> <p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Perform kinematic and dynamic analyses with simulation. 2. Design control laws for a robot. 3. Integrate mechanical and electrical hardware for a real prototype of robotic device. 4. Select a robotic system for given application. 			
<p>TEXTBOOKS:</p> <ol style="list-style-type: none"> 1. Saha, S.K., “Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014. 2. Ghosal, A., “Robotics”, Oxford, New Delhi, 2006. 3. Niku Saeed B., “Introduction to Robotics: Analysis, Systems, Applications”, PHI, New Delhi. 			

REFERENCE BOOKS:

1. Mittal R.K. and Nagrath I.J., "Robotics and Control", Tata McGraw Hill.
2. Mukherjee S., "Robotics and Automation", Khanna Publishing House, Delhi.
3. Craig, J.J., "Introduction to Robotics: Mechanics and Control", Pearson, New Delhi, 2009
4. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, "Robot Modelling and Control", John Wiley and Sons Inc, 2005
5. Steve Heath, "Embedded System Design", 2nd Edition, Newnes, Burlington, 2003
6. Merzouki R., Samantaray A.K., Phathak P.M. and Bouamama B. Ould, "Intelligent Mechatronic System: Modeling, Control and Diagnosis", Springer.

SEMANTIC WEB

Course Code	20CC813	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03

Credits – 3**UNIT - I**

Web Intelligence: Thinking and Intelligent Web Applications, The Information Age, The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Semantic Road Map, Logic on the semantic Web.

Knowledge Representation for the Semantic Web: Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

UNIT – II

Ontology Engineering: Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

Semantic Web Applications, Services and Technology: Semantic Web applications and services, Semantic Search, e-learning,

UNIT – III

Semantic Bioinformatics, Knowledge Base, XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods,

Course Outcomes:

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

1. To learn Web Intelligence
2. To learn Knowledge Representation for the Semantic Web
3. To learn Ontology Engineering
4. To learn Semantic Web Applications, Services and Technology
5. To learn Social Network Analysis and semantic web

TEXTBOOKS:

1. Thinking on the Web – Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

REFERENCE BOOKS:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O'Reilly, SPD.

DIGITAL IMAGE PROCESSING			
Course Code	20CC814	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
<p>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, Brightness Adaptation and Discrimination, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels.</p> <p>Image Enhancement in the Spatial Domain - Background, Some Basic Gray Level Transformations, Histogram Processing. Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Image Enhancement in the Frequency Domain- Background, Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters.</p>			15
UNIT - II			
Sharpening Frequency Domain Filters, Homomorphic Filtering, Image Segmentation- Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding,			16

<p>Region-Based Segmentation, Segmentation by Morphological Watersheds, the Use of Motion in Segmentation.</p> <p>Image Compression - Fundamentals Image Compression, Models Elements of Information, Theory Error-Free Compression, Lossy Compression, Image Compression Standards.</p> <p>Morphological Image Processing - Preliminaries, Dilation and Erosion, Opening and Closing, the Hit-or-Miss Transformation Some Basic, Morphological Algorithms.</p>	
<p>UNIT - III</p>	
<p>Color Image Processing - Color Fundamentals, Color Models, Pseudo color Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Noise in Color Images, Color Image Compression.</p>	<p>08</p>
<p><u>Course Outcomes:</u> Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Identify the concept of Digital Image Processing, Analyze Steps in Digital Image Processing, Apply the Knowledge of Image Sampling and Quantization and illustrate Some Basic Relationships between Pixels using Knowledge of 4-8 and M adjacency. 2. Analyze Smoothing Spatial Filters, Sharpening Spatial Filters by applying mathematical knowledge. Explain Frequency domain and illustrate Smoothing Frequency-Domain Filters. 3. Analyze Sharpening frequency-Domain Filters, Design and formulate Image segmentation techniques, prove the properties Region-Based Segmentation. 4. Illustrate and Design Image Compression Standards, Analyze the concept of Morphological Image Processing by applying mathematical knowledge. 5. Analyze color image processing techniques, illustrate color image sharpening, smoothing, compression, segmentation and Transform. 	
<p>TEXTBOOK:</p> <ol style="list-style-type: none"> 1. Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, Second Edition, 2003. 	
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Anil K Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India Pvt. Ltd., 1997. 2. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Thomson Learning, Brooks/Cole, Second Edition. 2001. 3. B.Chanda, D Dutta Majumder, "Digital Image Processing and Analysis", Prentice- Hall, India, 2002. 4. Steven W. Smith, "The Scientist and Engineers Guide to Digital Signal Processing", California Technical Publishing ,Second Edition , 1999. 	

INFORMATION RETRIEVAL			
Course Code	20CC815	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
<p>Introduction to Information Retrieval: The nature of unstructured and semi-structured text. Inverted index and Boolean queries.</p> <p>Text Indexing, Storage and Compression Text encoding: tokenization, stemming, stop words, phrases, index optimization. Index compression: lexicon compression and postings lists compression. Gap encoding, gamma codes, Zipf's Law. Index construction. Postings size estimation, merge sort, dynamic indexing, positional indexes, n-gram indexes, real-world issues.</p>			15
UNIT - II			
<p>Retrieval Models: Boolean, vector space, TFIDF, Okapi, probabilistic, language modeling, latent semantic indexing. Vector space scoring. The cosine measure. Efficiency considerations. Document length normalization. Relevance feedback and query expansion. Rocchio.</p> <p>Performance Evaluation: Evaluating search engines. User happiness, precision, recall, F-measure. Creating test collections: kappa measure, interjudge agreement.</p> <p>Text Categorization and Filtering Introduction to text classification. Naive Bayes models. Spam filtering. Vector space classification using hyperplanes; centroids; k Nearest Neighbors. Support vector machine classifiers. Kernel functions. Boosting.</p>			16
UNIT – III			
<p>Text Clustering Clustering versus classification. Partitioning methods. k-means clustering. Mixture of gaussians model. Hierarchical agglomerative clustering. Clustering terms using documents.</p> <p>Web Information Retrieval Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS.</p>			08
<p>Course Outcomes: Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand various information retrieval operations 2. Evaluate the Capability and performance of search engines 3. Understand basics of text categorization 			

<p>TEXTBOOKS:</p> <ol style="list-style-type: none"> 1. Christopher D. Manning, PrabhakarRaghavan and HinrichSchütze, Introduction to Information Retrieval, Cambridge University Press, 2008. 2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, MIT Press, 2010. 	
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. David A. Grossman and Ophir Frieder, Information Retrieval: Algorithms and Heuristics, Springer, 2004 2. Baeza-Yates and Ribeiro-Neto, Modern Information Retrieval, Addison Wesley, 1999 	

STORAGE TECHNOLOGY			
Course Code	20CC816	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
<p>An Overview of Data Storage Technology: Storage I/O Basics Access Time, Latency and Transfer Time; Input / Output (I/O) Stack; Storage Technologies. Data Protection, Backup and Restore: Reasons for Data Loss; Designing Storage Systems for Backup and Recovery – Recovery Time Objective and Recovery Point Objective, Internal and External Das Backup, LAN-based, SAN and NAS Backup, Backup and Restore Software; Data Security: Basic Concepts; Defense – Perimeter Defense, Host and Application Defense; Authentication and Access Control; Encryption; Attacks – Denial of Service, Exploiting Programmer Errors; Man-in-the- middle Attacks; Viruses and Trojan Horses; Information Lifecycle Management: Meaning of Information Lifecycle Management (ILM); Information. Storage Networks: DAS, NAS. SAN. Devices and Subsystems in Storage Networks: Architecture and Logic of SCSI.</p>			16
UNIT - II			
<p>Data Redundancy: Data Redundancy and Mirroring – Threats to data, Redundancy metrics: MTBF, MTDA, MTDL, and MTTR, Forms of data redundancy, Mirroring; RAID Fundamentals and Parity Redundancy in RAID; File System: File System Structures – Logical directory structures, Layout of data within a storage address space; File System Constructs and Functions; Fundamentals of Network File Systems – Network file system clients, Filer server systems. Introduction to Storage Virtualization: Core Concepts; Files and Records; Data as Files – File naming conventions, File ownership, Read/Write permission attributes, Time stamping, File size, File data location; Systematic Organization of Files – File system hierarchy, Parsing the file system, Master tables, File system integrity, File system strategies.</p>			15

UNIT - III	
Virtualized SAN File Systems: Conventional File Systems; Distributed File Systems; Virtualizing File Systems; Conventional Tape Backup; Disk- to-Disk-to-Tape (D2D2T); Virtualizing Tape Systems.	08
<p>Course Outcomes:</p> <p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Recognize complexity of Information Management, its key issues and solutions 2. Classify storage environment and various storage system architecture. 3. Demonstrate different types of network storage devices. 4. Distinguish various SAN architectures. 5. Conclude business continuity management and monitoring process. 	
<p>TEXTBOOK:</p> <ol style="list-style-type: none"> 1. EMC Corporation, Information Storage and Management, Wiley 	
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Robert Spalding, “Storage Networks: The Complete Reference“, Tata McGraw Hill, Osborne, 2003. 2. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne, 2001. 3. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002. 	

INFORMATION MANAGEMENT SYSTEM			
Course Code	20CC817	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT – I			Contact Hours
<p>Information Systems in Business: Introduction, The real world of Information Systems, Networks, What you need to know, The fundamental role of IS in business, Trends in IS, Managerial challenges of IT.</p> <p>System Concepts: A foundation, Components of an Information System, Information System Resources, Information System activities, Recognizing Information Systems. Fundamentals of strategic advantages: Strategic IT, Competitive strategy concepts, The competitive advantage of IT, Strategic uses of IT, Building a customer-focused business, The value chain and strategic IS, Reengineering business processes, Becoming an agile company, Creating a virtual company, Building a knowledge creating company.</p> <p>Enterprise Business Systems: Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems, Enterprise collaboration systems. Functional Business Systems: Introduction, Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, Financial management systems.</p>			16

UNIT - II	
<p>Customer relationship management: Introduction, What is CRM? The three phases of CRM, Benefits and challenges of CRM, Trends in CRM Enterprise resource planning: Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP.</p> <p>Supply chain Management: Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM.</p> <p>Electronic commerce fundamentals: Introduction, The scope of ecommerce, Essential ecommerce, processes, Electronic payment processes. e-Commerce applications and issues: Ecommerce application trends, Business-to- Consumer e-commerce, Web store requirements, Business-to- Business e-commerce, e-commerce marketplaces, Clicks and bricks in ecommerce</p>	15
UNIT – III	
<p>Decision support in business: Introduction, Decision support trends, Decision support systems (DSS), Management Information Systems, Online analytical processing, Using DSS, Executive information systems, Enterprise portals and decision support, Knowledge management systems, Business and Artificial Intelligence (AI), An overview of AI, Expert systems.</p>	08
<p><u>Course Outcomes:</u></p> <p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the role of information technology and information systems in business 2. Record the current issues of information technology and relate those issues to the firm 3. Interpret how to use information technology to solve business problems 	
<p>TEXTBOOK:</p> <ol style="list-style-type: none"> 1. James A. O’Brien, George M Marakas, Management Information Systems, 7th Edition, Tata McGrawHill. 	
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Kenneth C. Laudon and Jane P. Laudon, Management Information System, Managing the Digital Firm, 9th Edition, Pearson Education. 2. Steven Alter, Information Systems the Foundation of E-Business, 4th Edition, Pearson Education. 3. W. S. Jawadekar, Management Information System, Tata McGraw Hill 	

AUGMENTED AND VIRTUAL REALITY			
Course Code	20CC818	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT - I			Contact Hours
<p>Introduction To Virtual Reality: Virtual Reality & Virtual Environment : Introduction – Computer graphics – Real time computer graphics –Flight Simulation – Virtual environments – requirement – benefits of virtual reality- Historical development of VR : Introduction – Scientific Landmark -3D Computer Graphics :Introduction – The Virtual world space – positioning the virtual observer – the perspective projection – human vision – stereo perspective projection – 3D clipping – Color theory – Simple 3D modeling Illumination models – Reflection models – Shading algorithms- Radiosity – Hidden Surface Removal – Realism-Stereographic image. Geometric Modelling: Introduction – From 2D to 3D – 3D space curves – 3D boundary representation - Geometrical Transformations: Introduction – Frames of reference – Modeling transformations – Instances –Picking – Flying – Scaling the VE – Collision detection - A Generic VR system: Introduction – The virtual environment – the Computer environment – VR Technology – Model of interaction.</p>			16
UNIT – II			
<p>Virtual Environment: Animating the Virtual Environment: Introduction – The dynamics of numbers – Linear and Non-linear interpolation - The animation of objects – linear and non-linear translation - shape & object inbetweening – free from deformation – particle system- Physical Simulation: Introduction – Objects falling in a gravitational field –Rotating wheels – Elastic collisions – projectiles – simple pendulum – springs – Flight dynamics of an aircraft. VR Hardwares: Human factors : Introduction – the eye - the ear- the somatic senses - VR Hardware: Introduction – sensor hardware – Head-coupled displays –Acoustic hardware – Integrated VR systems</p>			15
UNIT - III			
<p>VR Software: Introduction –Modeling virtual world –Physical simulation- VR toolkits – Introduction to VRML. VR Application: Virtual Reality Applications: Introduction – Engineering – Entertainment – Science – Training – The Future: Introduction – Virtual environments – modes of interaction.</p>			08
Course Outcomes:			
<p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand concepts of Virtual Reality & geometric modelling 2. Build Animations and simulations for Virtual environment 3. Develop Virtual Reality Hardwares & Softwares and Virtual Reality applications 			
TEXTBOOK:			
<ol style="list-style-type: none"> 1. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007. 			

REFERENCE BOOKS:

1. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
2. Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology”, Wiley Interscience, 2nd Edition, 2006.
3. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application, and Design”, Morgan Kaufmann, 2008

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 (<i>for all except for those who have taken the subject in the VII semester</i>)
3.	20BT8X05	Nanotechnology (for all except BT)
4.	20CV8X07	Environment Impact Assessment (<i>for all except Civil & except for those who have taken the subject in the VII semester</i>)
5.	20ME8X08	Industrial Pollution Control (<i>for all except Mechanical & except for those who have taken the subject in the VII semester</i>)
6.	20EE8X10	Non-Conventional Energy Systems (<i>for all except EE, Mech. & except for those who have taken the subject in the VII semester</i>)
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 (<i>for all except Mechanical & except for those who have taken the subject in the VII semester</i>)
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 (<i>for all except for those who have taken the subject in the VII semester</i>)
16.	20HU8X71	Principles to Physical Education (<i>for all except for those who have taken the subject in the VII semester</i>)
17.	20HU8X72	Introduction to Japanese language (<i>for all except for those who have taken the subject in the VII semester</i>)
18.	20HU8X74	Introduction to German Language (for all <i>except for those who have taken the subject in the VII semester</i>)
19.	20ME8X75	Sustainable Development Goals (for all <i>except for those who have taken the subject in the VII semester</i>)
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

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.

11 Hours

Euler and Hamilton graphs

Eulerian and Hamiltonian graphs and their applications.

4 Hours

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:

adjacency matrix, incidence matrix, circuit matrix, cut set matrix. Path matrix

6 Hours

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:

Algorithms to find a spanning tree, minimal spanning tree-Kruskal's & Prim's algorithm.

05 Hours

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→	1	2	3	4	5	6	7	8	9	10	11	12
↓Course Outcomes												
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. "Discrete Mathematics and its applications", Kenneth H. Rosen, Tata McGraw Hill, V Edition - 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>

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 vectors, 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→	1	2	3	4	5	6	7	8	9	10	11	12
↓ Course Outcomes												
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", 3 rd 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 7 th edition ,2003.
4.	Sheldon Axler, "Linear Algebra Done Right", Springer International Publication, Third Edition,2015.

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																																																																																																									
UNIT - III																																																																																																																							
Case Studies: Patents: Biological Cases - i) Basmati rice ii) Turmeric iii) Neem; Non-biological cases – (i) TVS V/S Hero, (ii) Samsung V/S Nokia – Copyright and related rights – Trade Marks – Trade secrets - Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition; Technology transfer and license agreements (US anti-HIV drug license to Africa)														7																																																																																																									
Course Outcomes: At the end of the course student will be able to																																																																																																																							
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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:																																																																																																																							
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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-Poiseuille 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.

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>

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

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**.

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 Pyrhelimeter.

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→	1	2	3	4	5	6	7	8	9	10	11	12
↓ Course Outcomes:												
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

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

Course Learning Objectives:

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.

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	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

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**

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**.

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

<p>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</p>	15
<p>Etiquettes & Workplace Etiquette, Workplace Etiquettes, Workplace Readiness Skills, Significance of Cross-Cultural Understanding; Cultural Sensitivity, Impact of social media in Workplace</p>	

UNIT - II

<p>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</p>	15
<p>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</p>	

UNIT - III

<p>Writing Types of Writing, Note Taking Methods, Plagiarism Reading Styles of Reading, Types of Reading, Scanning, Skimming</p>	9
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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:

- Geetha.V. Gender. Kolkatta: Web Impressions, 2009.
- 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.
- Barry, Peter. Beginning Theory. New Delhi: Viva Books, 2010.
- Berger, John. Ways of Seeing. London: Penguin Books, 1977.
- Cranny-Francis, Anny, et al. Gender Studies: Terms and Debates. New York: Palgrave Macmillan, 2003.
- Gauntlett, David. Media, Gender and Identity: An Introduction. London: Routledge, 2008
- Pilcher, Jane, and Imelda Whelehan. 50 Key Concepts in Gender Studies. London: Sage, 2004. Print.
- Jeanne, Haraway Donna. Simians, Cyborgs, and Women. London: Free Association Books, 1991. Web.
- Koskela, Hille. "Webcams, TV Shows and Mobile Phones: Empowering Exhibitionism." Surveillance & Society 2.3 (2004): 199-215. Web.

E-RESOURCES:

- <http://www.cyberpsychology.eu/view.php?cisloclanku=2009061501/> >.
- [http://www.surveillance-and-society.org/articles2\(2\)/webcams.pdf](http://www.surveillance-and-society.org/articles2(2)/webcams.pdf)
- <http://eprints.rclis.org/19790/> >.

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.

MOOC/NPTEL Resources:

1. <http://nptel.ac.in/courses/110105067/>
2. <https://www.edx.org/course/operations-management-iimbx-om101-1x>

Course Articulation Matrix

Course Code / Name: 18ME8X28/ Operations Management & Entrepreneurship															
Course Outcomes (CO)	Program Outcomes (PO)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C-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.

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	
<u>Course Outcomes (CO):</u>	
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**.

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				
<u>Course Learning Objectives:</u>				
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↓		
													1	2	
↓ Course Outcomes															
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. Akmajan, 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.

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	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
COs														
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 H₂ Production; Photobiological H₂ Production: Biophotolysis and Photofermentation; H₂ Production by Fermentation: Biochemical Pathway, Batch Fermentation, Factors affecting H₂ production, Carbon sources, Detection and Quantification of H₂. 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., Nhuon, 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

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:

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

REFERENCE BOOKS:

1. Tchobanoglous, 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

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 remainder 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 remainder 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→	1	2	3	4	5	6	7	8	9	10	11	12
↓Course Outcomes												
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

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 file in 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.

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 Code / Name : 20ME8X63/ INNOVATION AND ENTREPRENEURSHIP														
Course Outcomes (CO)	Program Outcomes (PO)												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C-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

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.

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:

Course Code / Name: 20ME8X65 / Automotive Engineering														
Course Outcomes (CO)	Program Outcomes (PO)												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C-20ME8X65.1	3	1	-	-	-	1	-	-	3	1	-	1	3	3
C-20ME8X65.2	3	1	-	-	-	1	-	-	3	1	-	1	1	3
C-20ME8X65.3	3	1	1	-	-	1	-	-	3	1	-	1	3	3
C-20ME8X65.4	2	3	1	-	-	1	-	-	3	1	-	1	2	3
C-20ME8X65.5	3	1	1	-	-	1	1	1	3	1	-	1	2	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**.

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

Course Learning Objectives:

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, Yokohama Strategy, 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

Course Outcomes:

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.

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
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Classification of Yoga and Yogic texts:Yogasutra of Patanjali, Hatha yogic practices- Asanas, Pranayama, Dharana, Mudras and bandhas.	07 Hours
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UNIT – II

Yoga and Health: Concept of health and Diseases-Yogic concept of body – pancakosaviveka, Concept of disease according to Yoga Vasistha.	06 Hours
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Yogic concept of healthy living- rules & regulations, yogic diet, ahara, vihara. Yogic concept of holistic health.	04 Hours
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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
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UNIT - III

Yoga and physical development: Mind-body, Meditation, Yogasanas and their types. Different Yoga practices and Benefits.	05 Hours
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Specific guidelines and Yoga practices for – Flexibility, Stamina, Endurance (Surya Namaskara)	04 Hours
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Course Outcomes: At the end of the course student will be able to

1.	Understand a brief history of the development of Yoga
2.	Know important practices and principles of Yoga
3.	Explain how Yoga is important for healthy living
4.	Practice meditation to improvement of concentration etc.
5.	Have knowledge about specific guidelines of yoga practices

Course Outcomes Mapping with Program Outcomes & PSO

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

1: Low 2: Medium 3: High

TEXTBOOKS:	
1.	B.K.S. Iyengar, “Light on Yoga: The Classic Guide to Yoga by the World’s Foremost Authority”, Thorsons publisher 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

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

<p>(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.</p>	4
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Course Outcomes: At the end of the course student will be able to

1.	Examine how the culture has a very important role in human life and growth of human civilization and have a general awareness on historical perspective of growth of Indian Culture and Arts.
2.	Appreciate their own local culture from an academic perspective.
3.	Know about the impact of Western Rule in India and Indian Struggle for Freedom and also its impact on Indian Culture and Arts and able to appreciate and the role of language in connecting people, growth of culture and arts beyond the barriers of religion and ages.
4.	Take interest in learning these forms of arts, and also appreciate and preserve them for the future generations feeling proud of Indian Culture, Arts and Architecture.
5.	Appreciate art performances in India which will enable them to get exposed to an artistic sphere, which eventually help them to be creative and imaginative.

Course Outcomes Mapping with Program Outcomes & PSO

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

1: Low 2: Medium 3: High

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 First Aid, Scope of First Aid, Qualities of a First Aider, Fundamental Principles to be followed and the Duties to be performed by the First Aider, First Aid in Different Cases.

Physical Education - Concept of Physical Education, Physical Education Defined, Importance of Physical Education, Scope of Physical Education, Aims and Objectives of Physical Education.

Teaching Aid in Physical Education

Competition - Introduction, Types of competition, Knock out, League or Round Robin Tournament.

12 Hours

UNIT – III

Training in Sports – Meaning, Principles, Warming Up & Limbering Down

Importance of Anatomy and Physiology in Physical Education, Oxygen Debt and Second wind

Leadership and Supervision – Leadership, Qualities of a good leader in Physical Education, Types of Leadership in Physical Education - 1. Teacher Leadership 2. Student Leadership.

Measurement & specification of various playing fields – Cricket, Volley Ball, Basket Ball, Badminton, Ball Badminton, Foot Ball, Hand Ball & their basic playing skills.

16 Hours

Course Outcomes:

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

1. Demonstrate an understanding of the principles and concepts related to a variety of physical activities.
2. Apply health and fitness principles effectively through a variety of physical activities.
3. Support and encourage others (towards a positive working environment).
4. Show self-motivation, organization and responsible behavior.

Course Outcomes Mapping with Program Outcomes & PSO

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

1: Low 2: Medium 3: High

TEXT AND REFERENCE BOOKS:

1. A. K. Uppal, “Physical Education and Health”
2. M. L. Kamlesh, “Fundamental Elements of physical Education”,
3. Swami Ramdev, “Yog its philosophy and practice”, Divya Prakashan
4. V. K. Sharma, “Health and Physical Education”

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, Adjective, 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 nominative and accusative 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 accusative 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 politischen Karte der Welt, Nationalitäten und Sprachen, Die Uhrzeit (The time) telling time and talking about daily routine, Tage der Woche, die Monate, die vier Jahreszeiten, die Jahre
Mir gehtes gut: Asking people how they are, saying how you are, saying which cities and countries 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 vier Fälle (The four cases): Nominativ, Akkusativ, Dativ, Genitiv (Not in level A-1)

Deklination des bestimmten Artikels der/die/das

Deklination des unbestimmten Artikels ein/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 sieht ein Haus. Negation Peter sieht kein Haus.

(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 Personalpronomen im Nominativ

(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.

Präpositionen mit Akkusativ und Dativ

(Prepositions with accusative and dative)

1. Präpositionen mit Akkusativ (prepositions with accusative)

2. Präpositionen mit Dativ (prepositions with dative)

3. Präpositionen mit Akkusativ oder Dativ (prepositions with accusative or dative)

13

(With examples, writing and hearing exercises, and German to English Glossary as applicable)

UNIT - III

Konjugation von Verben im Präsens
(Conjugation of verbs in present tense)
Verbs are conjugated by attaching certain endings, depending on the person and number of the subject.

Trennbare und untrennbare Verben
(separable and inseparable verbs)

Verbs with prefixes are distinguished 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: bekommen. 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. Trennbare Verben (separable verbs)
2. Untrennbare Verben (inseparable verbs)

Konjugation von Verben im Perfekt
(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 Perfekts mit „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 Modalverb im Satz
(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 nominative and accusative 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 accusative 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↓	
													1	2
↓ Course Outcomes														
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, Unterrichtswerk fuer Erwachsene, Verlag Moritz Diesterweg, Universitaetsdruckerei H. Stuert AG Wuerzburg, 1989													
2.	Paul Coggle and Heiner Schenke, 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 Sprachlehre fuer Auslaender.													
2.	Themen Aktuell (Text and workbook).													
3.	Deutsch als Fremdsprache 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. Milind Brahma IIT Madras													
2.	https://www.traingerman.com/en/ powered by Sprachinstitut TREFFPUNKT Online													

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			

<p>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</p> <p style="text-align: right;">13 Hours</p>
UNIT – III
<p>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</p> <p>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.</p> <p style="text-align: right;">13 Hours</p>

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 Jonathan Tomkin, 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.

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 which facilitates 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:

- Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1stEdition, Pearson Education India. (ISBN:978-9332575271)

E RESOURCES:

- 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**.

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:

- Learn fundamental features of object oriented language and JAVA programming constructs.
- Develop and run simple Java programs using OOPS concepts of java
- Create multi-threaded programs and event driven Graphical User Interface (GUI) programming using swing package.

UNIT – I

Introduction to Java: Java's magic: The Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements.

Classes, Inheritance: Classes fundamentals; Declaring objects; Call by value and Call by Reference, array of objects, Constructors, this keyword, and usage of static keyword.

Inheritance: inheritance basics, using super, creating multi-level hierarchy, method Overriding, abstract classes, final classes.

15 Hours

UNIT – II

Exception handling, packages and interfaces: Exception handling in Java, use of try, catch blocks, multiple catch blocks, finally block, use of throw and throws clauses, creating custom exceptions. Packages, Access Protection, Importing Packages, Interfaces. IO Streams for file handling.

Multi-Threaded Programming:

What are threads? How to make the classes threadable; Extending threads; Implementing runnable interface; creating multiple threads, join and is Alive methods of Thread class, Thread Synchronization; achieving thread synchronization among multiple threads. Thread priorities, methods to get and set thread priority

15 Hours

UNIT – III

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model;

Swings:

The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; JLabel and ImageIcon; JTextField; The Swing Buttons; JTabbedPane; JScrollPane; JList; JComboBox; JTable.

09 Hours

Course Outcomes:

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

1. Apply the object-oriented concepts to solve real world problems using JAVA programming features
2. Illustrate the basic constructs and object oriented 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 perform file operations in Java
5. Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings

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

Graduate Attributes (GA)

This course will map the following GA as per NBA:

1. Design/Development of Solutions
2. Problem Analysis
3. Modern tool usage

TEXTBOOK:

1. Herbert Schildt, Java the Complete Reference, 7th Edition, Tata McGraw Hill, 2007. (Chapters 2-11, 22-24, 29,30)

REFERENCE BOOKS:

1. Mahesh Bhawe 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**.

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

Course Learning Objectives:

This course will enable students to:

1. **Outline** the concepts of data structures, its types, structures and pointers.
2. **Understand** linear data structures, namely, stack, queue, singly linked list and doubly linked list.
3. **Analyze** nonlinear data structures, namely, binary tree and graphs.
4. **Analyze** the non-recursive and recursive algorithms and to represent Efficiency of these algorithms in terms of the standard Asymptotic notations.
5. **Explain** the various algorithm design techniques and apply them to solve various real world problems.

UNIT – I**INTRODUCTION:**

Data Structure, Classification (Primitive and non-primitive), data structure operations.

POINTERS:

Definition and Concepts, Accessing variables through pointers, Arrays and pointers. Structures, pointers to structures.

LINEAR DATA STRUCTURES – STACKS:

Introduction and Definition, Representation of stack: Array and structure representation of stacks, Operations on stacks using C functions (Push(), Pop(), IsStackFull(), IsStackEmpty()).

LINEAR DATA STRUCTURES – QUEUES:

Introduction and Definition Representation of Queue: Array and Structure representation of queue, Operations on Ordinary Queue using C functions (Insert(), Remove(), IsQueueFul(), IsQueueEmpty())

15 Hours

UNIT – II**LINEAR DATA STRUCTURES - SINGLY LINKED LISTS:**

Dynamic Memory allocation functions. Definition and concepts singly linked List: Representation of link list in memory, Operations on singly Linked List using C functions (Insert node at front, Remove a node from front, display singly linked list).

LINEAR DATA STRUCTURES - DOUBLY LINKED LISTS:

Doubly Linked List: Representation. (Operations not included).

NONLINEAR DATA STRUCTURES – BINARY TREES:

Binary Trees: Properties, Linked representation of Binary Tree, Binary Tree Traversals, Introduction to Binary Search Tree.

INTRODUCTION TO ALGORITHMS:

What is an Algorithm? Fundamentals of Algorithmic Problem Solving, understanding and representing graphs using adjacency matrix and linked list.

FUNDAMENTALS OF THE ALGORITHMS EFFICIENCY:

Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms.

15 Hours

UNIT – III

DECREASE & CONQUER:

Concept of Decrease and Conquer, Graph traversal algorithms - Depth First Search, Breadth First Search.

DYNAMIC PROGRAMMING:

Concept of Dynamic Programming, Computing a Binomial Coefficient.

GREEDY METHOD:

Concept of Greedy technique, Prims algorithm.

BACKTRACKING:

Concept of Backtracking technique, N-Queens problem.

9 Hours

Course Outcomes:

1. **Acquire** the fundamental knowledge of various types of data structures and pointers using that knowledge, analyze and design the programs using pointers
2. **Apply** the fundamental programming knowledge of data structures to analyze and design linear data structures, namely, stack, queue, singly linked list and doubly linked list and use them for solving problems.
3. **Implement** and apply the concept of binary trees and graph data structures and also understand their traversals.
4. **Analyze** non-recursive or recursive algorithm and to represent in terms of standard Asymptotic notations.
5. **Apply** Divide and Conquer, Decrease and Conquer, Dynamic programming, Greedy, and Backtracking algorithm design techniques to solve real time problems.

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

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

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

TEXTBOOKS:

1. Aaron M. Tenenbaum, Yedidyah Langsam & Moshe J. Augenstein, “Data Structures using C”, Pearson Education/PHI, 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, Ronald 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.edu/>
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**

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

Course Outcomes:

At the end of the course student will be able to

1. Explain the roadway fundamentals, laws of motion, vehicle mechanics and propulsion system design.
2. Explain the working of electric vehicles and hybrid electric vehicles in recent trends.
3. Model batteries, Fuel cells, PEMFC and super capacitors.
4. Analyze DC and AC drive topologies used for electric vehicle application.
5. Develop the electric propulsion unit and its control for application of electric vehicles.

Course Outcomes Mapping with Program Outcomes & PSO												
Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12
↓ Course Outcomes												
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)

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

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	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

3: Substantial (High)

2: Moderate (Medium)

1: Poor (Low)

TEXTBOOKS:

1. Arshdeep Bahga, Vijay Madiseti, "Internet of Things: A Hands-On Approach, Vijay Madiseti", 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↓		
													1	2	
↓ Course Outcomes															
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. Gupta, Ramesh Publishing House, New Delhi.

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-Sharpning.
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. I.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>

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↓	
↓ 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** full questions from **Unit-I & Unit – II** and **1** full question from **Unit– III**.

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** full questions from **Unit-I & Unit – II** and **1** full question from **Unit– III**.

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. Discuss the different communication systems used for satellite access.
8. Summarise Advanced space systems for mobile communication, VSAT, GPS.

UNIT – I

Satellite communications: Introduction, Kepler's laws, definitions, orbital element, apogee and perigee heights, 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

Launch Vehicles: Working, stages, Fuel, payload protection, Navigation, guidance and control, Reliability, launching into outer 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.

Advanced space systems: Satellite mobile services, VSAT, Radarsat, orbital communication. Global Positioning 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)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student must obtain minimum of 20 marks out of 50 in CIE and 20 marks out of 50 in SEE and 40% in total to obtain a pass grade. 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 (16%) and module assignments (4%). Course coordinator will announce the evaluation procedure at the beginning of the semester and will be recorded in the course plan.

Semester End Examination:

1. 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:

- T1. Dennis Roddy, “Satellite Communications”, McGraw Hill 1996.
- T2. Timothy Pratt, “Satellite Communications”, Wiley India Ltd, 2006.
- T3. K Ramamurthy, “Rocket Propulsion”, McMillan Publishers India Ltd, 2010.

REFERENCE BOOKS:

- R1. George Joseph, “Fundamentals of Remote Sensing”, Universities press, India 2003.
- R2. BC Pande, “Remote sensing and Applications”, VIVA Books Pvt Ltd, 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>

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. Thalasa-Aadi thala, yeka thala, Kore thala and Asta Thala with biditha and mukthya- Practice. Dhingina – Practice.....

14 Hours

UNIT – II

Thalasa- Rupaka Thala, Trivide Thala, Jampe thala etc. with biditha and mukthaya.

Dhigina – Practice
 Rangasthala Pravesha steps and Eripada ettugade steps.
 Revision of all Thalasa.
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 Arthagarika: Ondu Vishleshane: Dr.Ramananda Banari.
2. Yaksha Naatyanjali Thenkuthittu- Sampadaka: Sathish Madivala, Karkala.
3. Yakshagna Shikshana Patya Pustka- Prathamika vibhaga (Karnatka Patya pusthaka sangha- Bengaluru)
4. Koralara: YakshaganaVimarsha Sankalana: Dr.M. Prabhakara Joshi
5. Vaagartha Gawrava: (Dr. Joshi Abhinandana Guchaha): Ga. Na. Bhat

MARKETING MANAGEMENT			
Course Code	20ME8X88	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Understand and learn the marketing concepts and their application to profit-oriented and 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 in retailing.

7 Hours

Course Outcomes (CO):

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

CO1	Explain the basic marketing concepts
CO2	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 the goals of marketing

TEXTBOOK:

1. Govindarajan. M. 'Modern Marketing Management', Narosa Publishing House, New Delhi, 1999

REFERENCE BOOKS:

1. Philip Kotler, " 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.
