



NITTE
EDUCATION TRUST


**NMAM INSTITUTE
OF TECHNOLOGY**

College Calendar 2023-24


Department of Artificial Intelligence & Machine Learning Engineering





**Syllabus
of
4th Year**



NITTE | **NMAM INSTITUTE OF TECHNOLOGY**
EDUCATION TRUST
(An Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi)
Nitte - 574110, Karnataka, India
ISO 9001: 2015 Certified, Accredited by NAAC with 'A' Grade



VII & VIII SEMESTER
Department of Artificial Intelligence & Machine Learning Engineering



College Calendar 2023-24

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

ಮಾತೇವ ರಕ್ಷತಿ ಪಿತೇವ ಹಿತೇ ನಿಯುಂಕ್ತೇ
ಕಾಂತೇವ ಚಾಪಿ 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.



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

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COLLEGE CALENDAR

2023-24

(VII & VIII Semester)





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Vision Statement

Pursuing Excellence, Empowering people, Partnering in
CommUNITY Development

Mission Statement

To develop N.M.A.M. Institute of Technology, Nitte, as Centre of Excellence
by imparting Quality Education to generate competent,
Skilled and Humane Manpower to face emerging Scientific, Technological,
Managerial and Social Challenges
with Credibility, Integrity, Ethics and Social Concern.

In Memorium



Late Nitte Mahalinga Adyanthaya

Our Founder



Late Justice K. S. Hegde
1909-1990



SRI N. VINAYA HEGDE

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



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

HEADS OF DEPARTMENTS

1.	Dr. Arun Kumar Bhat	HoD, Civil Engg.
2.	Dr. Jyothi Shetty	HoD, Comp. Science & Engg
3.	Dr. Ashwini B	HoD, Information Science & Engg
4.	Dr. Ujwal P	HoD, Biotechnology
5.	Dr. KVSSSS Sairam	HoD, E&C Engg.
6.	Dr. Suryanarayana K	HoD, E&E Engg.
7.	Dr. Muralidhara	HoD, Robotics & Artificial Intelligence
8.	Dr. Kumudakshi	HoD, Mathematics
9.	Dr. Shobha R. Prabhu	HoD, Physics
10.	Dr. Shivaprasad Shetty M.	HoD, Chemistry
11.	Dr. Mamatha Balipa	HoD, MCA

12.	Dr. Vishwanatha	HoD, Humanities
13.	Dr. Udaya Kumar K Shenoy	HoD, Computer & Communication Engg
14.	Dr. Sharada Uday Shenoy	HoD, Artificial Intelligence & Machine Learning
15.	Dr. Srinivas Pai P	HoD, Mechanical Engg
16.	Dr. Venugopala PS	HoD, Artificial Intelligence & Data Science
17.	Mr. Bharath G Kumar	Head, Training & Placement Cell

INCHARGE OF INSTITUTION'S RESPONSIBILITIES

1.	Dr. Shashikanth Karinka	Co-ordinator MoUs
2.	Dr. Gururaj Upadhyaya	Workshop Suptd
3.	Dr. Joy Elvine Martis	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

<p>1. No. of Semesters / Year Three; Two being Main semesters (odd, even) and one being a supplementary semester; after 2 main semesters.</p> <p>(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.)</p>	
2. Semester Duration	Main semester (odd, even) each 19 Weeks; Supplementary Semester 8 Weeks
3. Academic Activities	Main Semester
(Weeks):	<p>Registration of Courses & Course Work (16.0) Examination Preparation and Examination (3.0) Total (19)</p> <p>Supplementary Semester Registration of Courses & Course Work (5.0) Examination Preparation and Examination (3.0) Total (8)</p> <p>Declaration of results: 2 weeks from the date of last examination</p> <p>Inter- Semester Recess: After each Main Semester (2)</p> <p>Total Vacation: 10 weeks (for those who do not register for supplementary semester) and 4 weeks (for those who register for supplementary semester)</p>

(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 $\geq 85\%$ 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.

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

SGPA = _____

$$\sum [(\text{course credits})]$$

CGPA is computed as follows:

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

CGPA = _____

$$\sum [(\text{course credits})] \text{ (for all courses excluding those with F grades until that semester)}$$

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

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

Registration:

- (i) Any student meeting the eligibility criteria and interested to register for Honors degree qualification shall apply to the University through the Principal in the prescribed form along with the prescribed application fees within 15 working days after notification by the University.
- (ii) The Registrar shall notify the registration of the student and it will be notified to the student and the student shall pay a one-time, non-refundable registration fees as prescribed by the University to confirm the registration.

Award of Honors Qualification:

- (i) Students who successfully complete the MOOCs prescribed by the University and submit their E-certificates to the University through the Principal against the notification issued by the Registrar in time before the closure of eighth semester, as per the academic calendar shall be eligible for B.E. (Honors) degree. If a student does not submit the certificates in time on or before the last date, their request shall not be considered, even if they have earned the requisite number of credits.
- (ii) The Honors degree shall be awarded only if the CGPA at the end of the B.E. programme is equal to or greater than 8.5.
- (iii) A student who has earned the requisite number of credits and who has submitted the certificates in time and has been accepted by the University will get B.E. degree with Honors suffixed indicating recognition of higher achievement by the student concerned.
- (iv) Further students fulfilling all the above requirements shall be entitled to receive their transcripts indicating both the achievement of the student concerned.
- (v) The award of the Honors degree shall be recommended by the Academic Senate and approved by the Executive Council of the University.

14.2 (1) Noncompliance of CGPA \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 ≥ 5.00 , the students shall become eligible for the award of the degree. If $CGPA < 5.00$, the students shall follow the procedure laid in 14.2 (1) b
- (d) In case, the students earn improved grade/s in some course/s and the same or lesser than the previously earned pass grade/s in the other reappeared course/s, the CGPA shall be calculated considering the improved grade/s and the pass grades earned before the reappearance. If it is ≥ 5.00 , the students shall become eligible for the award of the degree. If $CGPA < 5.00$, the students shall follow the procedure laid in 14.2 (1) b
- (e) In case, the students earn improved grade/s in some courses and fail in the other reappeared course/s, the CGPA shall be calculated by considering the improved grade/s and the previously earned pass grade/s of the reappeared course/s in which the students have failed. If it is ≥ 5.00 , the students shall become eligible for the award of the degree. If $CGPA < 5.00$, the students shall follow the procedure laid in 14.2 (1) b
- (f) In case, the students fail (i.e., earns F grade) in all the reappeared course/s, pass grade/s of the course/s earned by the students before reappearance shall be retained. In such cases, the students shall follow the procedure laid in 14.2 (1) b
- (g) Students shall obtain written permission from the Registrar (Evaluation) to reappear in SEE to make up the CGPA equal to or greater than 5.00.

(2) Noncompliance of Mini-project

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

(3) Noncompliance of Internship

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

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

15 GRADUATION REQUIREMENTS AND CONVOCATION

- 15.1 A student shall be declared to be eligible for the award of the degree if he/she has

- a) Fulfilled "Award of Degree" Requirements
- b) No Dues to the College, Departments, Hostels, Library, Central Computer Centre and any other centres
- c) No disciplinary action pending against him/her.

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

15.3 Convocation

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

16 **AWARD OF PRIZES, MEDALS, CLASS & RANKS**

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

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

17 **CONDUCT AND DISCIPLINE**

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

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

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

- a) Ragging.
- b) Lack of courtesy and decorum; indecent behaviour anywhere within or outside the campus.
- c) Willful damage or stealthy removal of any property/belongings of the College/Hostel or of fellow students/citizens.
- d) Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.
- e) Mutilation or unauthorized possession of Library books.
- f) Noisy and unseemly behaviour, disturbing studies of fellow students.
- g) Hacking in computer systems (such as entering into other Person's

area without prior permission, manipulation and/or Damage of computer hardware and software or any other Cyber crime etc.).

- h) Plagiarism of any nature.
- i) Any other act of gross indiscipline as decided by the Senate from time to time.
- j) Use of Mobile in the college Academic area.
- k) Smoking in College Campus and supari chewing.
- l) Unauthorized fund raising and promoting sales.

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

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

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

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

18. EARNING OF ACTIVITY POINTS FOR THE AWARD OF DEGREE

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


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

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

- 18.4 Activity Points (non-credit) have no effect on SGPA/CGPA point.
- 18.5 In case students fail to earn the prescribed Activity Points, Eighth semester Grade Card shall be issued only after earning the required Activity Points.

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

LIST OF MAJOR SCHOLARSHIPS

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

- 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

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING ENGINEERING

VII & VIII SEMESTER

With

Scheme of Teaching

& Examination

Faculty

Sl. No.	Faculty Name	Qualification	Designation
1.	Dr. Sharada U Shenoy	B.E, M.Tech., Ph.D	Professor & HOD
2.	Mr. Sudesh Rao	B.E, M.Tech., (Ph.D)	Asst. Prof Gd II
3.	Mrs. Disha D N	B.E, M.Tech., (PhD)	Asst. Prof Gd II
4.	Mr. Mahesh B L	B.E, M.Tech. (PhD)	Asst. Prof Gd II
5.	Mrs. Rakshitha	B.E, M.Tech., (Ph.D)	Asst. Prof Gd I
6.	Ms. Swathi Pai M	B.E, M.Tech., (Ph.D)	Asst. Prof Gd II
7.	Mrs. Sneha Shetty	B.E, M.Tech., (Ph.D)	Asst. Prof Gd I
8.	Mr. Anirudhan Adukkathayar C	B.E, M.Tech., (Ph.D)	Asst. Prof Gd I

VISION

To be a center of excellence in Artificial Intelligence and Machine Learning Engineering education and research, to produce comprehensively trained, technically skilled, ethically strong, innovative engineers to excel globally, take future challenges and contribute to social welfare.

MISSION:

- To provide excellent academic environment to students for continuous improvement in Computer Science, Artificial Intelligence and Machine learning specialization by imparting education with innovation, skills, and positive attitude to make them competent engineers and leaders to solve the real-world problems to inculcate values of professional ethics, leadership qualities and lifelong learning.
- To strengthen the industry partnership for collaborative work and prepare graduates in cutting edge Artificial Intelligence technologies in par with industrial standards by undertaking collaborative projects which offer opportunities for long term interaction between academia and industry.
- To inculcate research, ethical values, professionalism, lifelong learning to make them globally competent and socially committed.
- To provide resources that contribute to congenial learning environment and encourage students to pursue higher education and take competitive exams.

Program Educational Objectives (PEOs)

After few years of graduation, the graduates of B. E in **Artificial Intelligence & Machine Learning** will:

1. Demonstrate technical skills, competency in computer science, artificial intelligence and machine learning and exhibit team management capability with effective communication and responsibility in their career.
2. Emerge as engineering professionals, innovators or entrepreneurs engaged in technology deployment and support the growth of economy of a country with a lifelong learning attitude.
3. Use basic science and engineering ideas to carry out research, pursue higher studies in the multidisciplinary areas to address the basic needs of the society.

Program Outcomes (POs):

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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

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

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

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

Program Specific Outcomes (PSOs)

1. Gain both theoretical and practical knowledge of human cognition, Artificial Intelligence, Machine Learning, Deep learning and data engineering for designing intelligent systems.
2. Apply computational knowledge, tools, techniques and project development skills to provide innovative solutions for social wellbeing.

N.M.A.M. INSTITUTE OF TECHNOLOGY
Scheme of Teaching and Examination 2020 – 21
Choice Based Credit System (CBCS) AND Outcome Based Education (OBE)
(Effective from the academic year 2023 – 24)

VII SEMESTER

Sl.No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Mini-Project	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	HU	20AM701	Management and Entrepreneurship	HU	3	0	0	0	03	50	50	100	3
2	PC	20AM702	Software Engineering and Management	AME	3	2	0	0	03	50	50	100	4
3	PC	20AM703	Optimization Techniques in Machine Learning	AME	3	2	0	S	03	50	50	100	4
4	PC	20AM704	Project Phase I	AME	0	0	6	0	-	50	-	50	2
5	PE	20AM74X	Elective- IV	AME	3	0	0	0	03	50	50	100	3
6	PE	20AM75X	Elective – V	AME	3	0	0	0	03	50	50	100	3
7	OE	20xy71X	Open Elective – I	AME	3	0	0	0	03	50	50	100	3
8		20AM705	Seminar on Special Topic	AME	0	2	0	0	-	50	-	50	1
Total					18	4	8	0		450	300	750	23

Note: PC: Professional Core, PE: Professional Elective, BS: Basic Science, HS: Humanities, OE: Open Elective

Project work: Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary project can be assigned to an individual student or to a group having not more than 4 students. In extraordinary cases, like the funded projects requiring students from different disciplines, the project student strength can be 5 or 6.

CIE procedure for Project Work Phase - 1:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work phase -1, shall be based on the evaluation of the project work phase -1 Report (covering Literature Survey, Problem identification, Objectives and Methodology), project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the Project report shall be the same for all the batch mates. **(ii) Interdisciplinary:** Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work phase -1, shall be based on the evaluation of project work phase -1 Report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

N.M.A.M. INSTITUTE OF TECHNOLOGY Scheme of Teaching and Examination 2020 – 21 Choice Based Credit System (CBCS) AND Outcome Based Education (OBE) (Effective from the academic year 2020 – 21)												
VIII SEMESTER												
Sl.No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PE	20AM86X	Elective – VI	AME	3	0	0	03	50	50	100	3
2	OE	20xyXXX	Open Elective – II	AME	3	0	0	03	50	50	100	3
3	PC	20AM801	Project Phase-II	AME	0	0	24	03	100	100	200	12
4	IN	20AM802	Internship Reporting	AME	-	6	-	-	50	50	100	3
Total					6	6	24	-	250	250	500	21
Note : PC: Professional Core, PE: Professional Elective, BS: Basic Science, HS: Humanities, OE: Open Elective IN: Internship												

Internship: All the students admitted to BE shall have to undergo mandatory internship of 4 weeks during the vacation at the end of 4th, 5th,6th and/or 7th semester. A University examination shall be conducted during VIII semester and the prescribed credit shall be included in 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 and shall have to complete during subsequent University examination after satisfying the internship requirements

Project work:

CIE procedure for project phase II is same as that of project phase I

SEE procedure: i) **Single discipline:** Contribution to the project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted at the department. ii) **Interdisciplinary:** Contribution to the project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted separately at the departments to which the student/s belong to.

PROFESSIONAL ELECTIVE GROUPS

Elective – IV		Elective – V	
20AM711	INFORMATION MANAGEMENT SYSTEM	20AM721	MOBILE APPLICATION DEVELOPMENT
20AM712	UNIX SYSTEM PROGRAMMING	20AM722	BIO INFORMATICS
20AM713	GENERATIVE ADVERSARIAL NETWORKS	20AM723	SYSTEM MODELLING AND SIMULATION
20AM714	GAME THEORY AND APPLICATIONS	20AM724	LARGE LANGUAGE MODELS AND PROMPT ENGINEERING WITH GPT3
20AM715	OPERATIONS RESEARCH	20AM725	TEXT MINING
Elective – VI			
20AM811	CRYPTOGRAPHY AND CYBER SECURITY		
20AM812	REINFORCEMENT LEARNING		
20AM813	BUSINESS INTELLIGENCE		
20AM814	DISTRIBUTED SYSTEMS		
20AM815	HIGH PERFORMANCE COMPUTING		

MANAGEMENT AND ENTREPRENEURSHIP

Course Code	20AM701	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>Management: Introduction - Meaning - nature and characteristics of Management, Scope and Functional areas of management - Management as art or science, art or profession-Management&Administration-RolesofManagement,LevelsofManagement, Development of Management Thought - early management approaches –Modem management approaches.</p> <p>Planning: Nature, importance and purpose of planning process objectives - Types of plans (meaning only) - Decision making, Importance of planning - steps in planning & planning premises-Hierarchy of plans.</p> <p>Organizing and staffing: Nature and purpose of organization, Principles of organization–Typesoforganization-DepartmentationCommittees-CentralizationVsDecentralization of authority and responsibility - Span of control - MBO and MBE(Meaning only)Nature and importance of staffing--:Process of Selection &Recruitment(in brief).</p> <p>Directing: Meaning and nature of directing Leadership styles, Motivation, Theories, Communication - Meaning and importance - coordination, meaning and importance and Techniques of coordination.</p> <p>Controlling: Meaning and steps in controlling - Essentials of a sound control system – Methods of establishing control (in brief).</p>			15
UNIT - II			
<p>Entrepreneur: Meaning of Entrepreneur; Evolution of .the Concept; Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur - an emerging. Class. Concept of Entrepreneurship - Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship-its Barriers.</p> <p>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; Government Support for SSI during 5 year plans. Impact of Liberalization, Privatization, Globalization on SSI Effect of WTO/GATT Supporting Agencies of Government for SSI, Meaning, Nature of support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition Only).</p> <p>Institutional support: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency; SISI; NSIC; SIDBI; KSFC.</p>			14
UNIT - III			
<p>Preparation of project: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning</p>			10

<p>Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of. Business OpportUNITies: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.</p> <p>Industrial ownership: Definition and meaning of Partnership, Characteristics of Partnership, Kinds of Partners, Partnership Agreement or Partnership Deed, Registration of Partnership Firm, Rights, Duties and Liabilities of Partners, Advantages and Disadvantages of Partnership, Sole proprietorship, Features, Scope Advantages and Disadvantages of Sole Proprietorship.</p>	
<p>Course Outcomes:</p> <p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Explainmanagementfunctionsofamanager.Alsoexplainplanninganddecisionmakingprocesses. 2. Explain the organizational structure, staffing and leadership processes. 3. UnderstandingofEntrepreneurshipsandEntrepreneurshipdevelopmentprocess. 4. Illustrate Small Scale Industries, various types of supporting agencies and financing available for an entrepreneur. 5. Summarize the preparation of project report, need significance of report. Also to explain about industrial ownership. 	
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Principles of Management–P.C.Tripathi, P.N.Reddy–Tata McGraw Hill. 2. Dynamics of Entrepreneurial Development & Management-Vasant Desai, Himalaya Publishing House. 3. Entrepreneurship Development – Poornima.M.Charantimath, Small Business Enterprises– Pearson Education-2006 	
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Management Fundamentals - Concepts, Application, Skill Development – Robers Lusier, Thomson. 2. Entrepreneurship Development -S.S.Khanka, S.Chand & Co. NewDelhi. 3. Management-Stephen Robbins, Pearson Education/PHI-17thEdition, 2003. 	

SOFTWARE ENGINEERING AND MANAGEMENT
(Effective from the academic year 2023 -2024)
SEMESTER – VII

Course Code	20AM702	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			
Course Learning Objectives:			
<ol style="list-style-type: none"> 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			Contact Hours
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
UNIT - II			
System Models: Context models, Interaction models, Structural models, Behavioral models. 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.			14
UNIT - III			
Project Management: Risk management, Teamwork Project Planning: Software pricing, Plan-driven development, Project Scheduling			10

Quality Management: Software quality, Reviews and inspections, Software measurement and metrics, Software standards.

Course Outcomes:

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

1. Recognize 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.

TEXTBOOK:

Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education, 2012.

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 Books / MOOCs/ NPTEL

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>

Course Outcomes Mapping with Program Outcomes & PSO

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

1: Low 2: Medium 3: High

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1,2,3,4,5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3 .1.1,3.1.2 4.1.1,4.1.2,5.1.1,5.2.1,5.2.2,5.3.1	L2
CO2	1,2,3,4,5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3 .1.1,3.1.2 4.1.1,4.1.2,5.1.1,5.2.1,5.2.2,5.3.1	L3
CO3	1,2,3,4,5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3 .1.1,3.1.2 4.1.1,4.1.2,5.1.1,5.2.1,5.2.2,5.3.1	L2
CO4	1,2,3,4,5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3 .1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2
CO5	1,2,3,4,5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3 .1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2

OPTIMIZATION TECHNIQUES IN MACHINE LEARNING			
Course Code	20AM703	CIE Marks	50
Number of Contact Hours/Week	3:2:0:S	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT - I			Contact Hours
<p>Overview of Optimization: Optimization, Objective function, Decision Variables, Solutions for optimization problem, Decision space, Constraints or restrictions, State variables, Local and Global optima, Near Optimal solutions, Simulation</p> <p>Introduction to Meta Heuristic and Evolutionary Algorithms: Introduction to optimization and meta heuristic algorithms, Searching the decision space for Optimal solutions, Definition of Terms of meta heuristic and Evolutionary algorithms, Initial state, Iterations, Final state, Initial data, Decision variables, state variables, objective function, Constraints, Fitness function</p>			15
UNIT - II			
<p>Particle swarm optimization: Introduction, mapping particle swarm optimization to social behaviour of some animals, generating an initial population of particles, an individual and global best positions, Velocities of particles, Updating the position of particles, Termination criteria, User defined parameters of the PSO</p> <p>Genetic algorithm: Introduction, Mapping the genetic algorithm to natural evolution, Creating the initial population, Selection of parents to create new generation: Proportionate selection, Ranking selection, Tournament selection, Population diversity and selective pressure, Reproduction: Crossover, Mutation, Termination criteria</p>			15
UNIT - III			
<p>Optimization techniques large scale machine learning: Stochastic optimization methods for large datasets, Distributed optimization algorithms, Online learning and incremental optimization, Markov Decision Processes (MDPs) and reinforcement learning, Value iteration and policy iteration, Q-learning and SARSA algorithms, Function approximation in reinforcement learning</p>			9
<p>Course Outcomes: Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Learn about the basics of optimization techniques 2. Describe the concepts on meta heuristic evolutionary algorithms 3. Apply particle swarm optimization on real time problems 4. Describe genetic algorithms and its applications 5. Demonstrate optimization techniques for large scale machine learning 			

TEXTBOOK:

1. “Meta-Heuristic and Evolutionary Algorithms for Engineering Optimization” by Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loáiciga, 2017

REFERENCE BOOKS:

1. Metaheuristics - From Design to Implementation: 74 (Wiley Series on Parallel and Distributed Computing) by EI-Ghazali Talbi 2009
2. Essentials of Metaheuristics by Sean Luke, Second Edition February, 2016

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

Table 2: Mapping of Cos to PIs, Pos and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1, 9.1.1, 10.1.1	L2, L3
CO2	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1, 9.1.1, 10.1.1	L2, L3
CO3	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3,5.1.1, 9.1.1, 10.1.1	L2, L3
CO4	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3, 5.1.2, 9.1.1, 10.1.1	L2, L3
CO5	1, 2	1.3.1,1.4.1, 2.1.3	L2

INFORMATION MANAGEMENT SYSTEM			
Course Code	20AM711	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> <p>Course Outcomes:</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 	08
<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 	

UNIX SYSTEM PROGRAMMING			
Course Code	20AM712	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>			
<ol style="list-style-type: none"> 1) Interpret the features of UNIX and basic commands. 2) Demonstrate different UNIX files and permissions 3) Implement shell programs. 4) Explain UNIX process, IPC and signals. 			
UNIT - I			Contact Hours
<p>Introduction: UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards. UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics.</p> <p>UNIX Files and APIs: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links. UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs</p>			15
UNIT - II			
<p>UNIX Processes and Process Control: The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes. Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection. Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups.</p>			

Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.1b Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.	15																																																																																																																							
UNIT - III																																																																																																																								
Interprocess Communication: Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores. Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.	9																																																																																																																							
Course Outcomes: Upon completion of this course, students will be able to: <ol style="list-style-type: none"> 1. Explain the basic concepts of UNIX Architecture, File system and basic commands. 2. Understand the basic file system commands, concepts of Shell programming. 3. Describe the concepts UNIX API's and process control. 4. Explain the concepts of process accounting, User identification and different IPC mechanisms. 5. Understand signal handling mechanism, daemon characteristics, coding rules and error logging. 																																																																																																																								
TEXTBOOKS: <ol style="list-style-type: none"> 1. Unix System Programming Using C++ - Terrence Chan, PHI, 1999. 2. Advanced Programming in the UNIX Environment - W.Richard Stevens, Stephen A. Rago, 3rd Edition, Pearson Education / PHI, 2005. 																																																																																																																								
REFERENCE BOOKS: <ol style="list-style-type: none"> 1. Advanced Unix Programming- Marc J. Rochkind, 2nd Edition, Pearson Education, 2005. 2. The Design of the UNIX Operating System - Maurice.J.Bach, Pearson Education / PHI, 1987. 3. Unix Internals - Uresh Vahalia, Pearson Education, 2001. 																																																																																																																								
E Books / MOOCs/ NPTEL: <ol style="list-style-type: none"> 1) https://nptel.ac.in/courses/117106113 2) https://www.udemy.com/course/linux-system-programming/ 																																																																																																																								
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="15" style="padding: 5px;">Table 1: Mapping Levels of COs to Pos</th> </tr> <tr> <th rowspan="2" style="padding: 5px;">Cos</th> <th colspan="12" style="padding: 5px;">Program Objectives (POs)</th> <th colspan="2" style="padding: 5px;">PSOs</th> </tr> <tr> <th style="padding: 5px;">1</th> <th style="padding: 5px;">2</th> <th style="padding: 5px;">3</th> <th style="padding: 5px;">4</th> <th style="padding: 5px;">5</th> <th style="padding: 5px;">6</th> <th style="padding: 5px;">7</th> <th style="padding: 5px;">8</th> <th style="padding: 5px;">9</th> <th style="padding: 5px;">10</th> <th style="padding: 5px;">11</th> <th style="padding: 5px;">12</th> <th style="padding: 5px;">1</th> <th style="padding: 5px;">2</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">CO1</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;">2</td> </tr> <tr> <td style="padding: 5px;">CO2</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;">2</td> </tr> <tr> <td style="padding: 5px;">CO3</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;">2</td> </tr> <tr> <td style="padding: 5px;">CO4</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;">2</td> </tr> <tr> <td style="padding: 5px;">CO5</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;">2</td> </tr> </tbody> </table>		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	CO2	3	2												2	CO3	3	2												2	CO4	3	2												2	CO5	3	3												2
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GENERATIVE ADVERSARIAL NETWORKS			
Course Code	20AM713	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 are generative models, what are generative adversarial networks, why we need GAN, Up sampling in GANs, how to use Up sampling layer, Transpose Convolutional Layer, GAN Training algorithm, Understanding GAN loss function, Train GAN models in practice, Challenge for training GANs, Heuristics for training GANs, Deep convolutional GANs</p> <p>Developing 1D GAN: Select one dimensional function, Discriminator model, Generator model, Training generator model, Evaluating performance of GAN.</p>			15
UNIT - II			
<p>Develop a DCGAN: Define and Train the discriminator model, Use generator model for DCGAN, Evaluate GAN model performance</p> <p>Diagnose GAN Failure Modes: Train a stable GAN, identify mode of collapse, Identify convergence failure</p> <p>GAN evaluation: Problem with evaluating generator models, Manual GAN Generator evaluation, Qualitative GAN Generator evaluation, Quantitative GAN generator evaluation</p>			15
UNIT - III			
<p>GAN Loss: Challenge of GAN Loss, Standard GAN loss function, alternate GAN Loss functions</p> <p>Advanced GANs: Brittleness of GAN Training, Develop better GANs by scaling up, How to scale up GANs with BigGAN</p>			09
<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 basics of Generative Adversarial Networks 2. Implement 1D Gan generation 3. Illustrate the generation of DCGAN 4. Apply GAN evaluation techniques 5. Describe Advanced GAN and Loss functions 			

TEXTBOOKS:	
<ol style="list-style-type: none"> Generative Adversarial Networks with Python: Deep Learning Generative Models for Image Synthesis and Image Translation by Jason Brownlee, machine learning mastery, 2019 Generative Deep learning: Teaching machines to Paint, Write, Compose and Play by David Foster, Oreilly Publications, 2019 	

REFERENCE BOOKS:	
<ol style="list-style-type: none"> “Generative Adversarial Networks Cookbook: Over 100 recipes to build generative models using Python, TensorFlow, and Keras” by Josh Kalin, 2018 “Hands-On Generative Adversarial Networks with Keras: Your guide to implementing next-generation generative adversarial networks” by Rafael Valle, 2019 	

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

Table 2: Mapping of Cos to PIs, Pos and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom’s Taxonomy Level
CO1	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1, 9.1.1, 10.1.1	L2, L3
CO2	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1, 9.1.1, 10.1.1	L2, L3
CO3	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3,5.1.1, 9.1.1, 10.1.1	L2, L3
CO4	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3, 5.1.2, 9.1.1, 10.1.1	L2, L3
CO5	1, 2	1.3.1,1.4.1, 2.1.3	L2

GAME THEORY AND APPLICATIONS

Course Code	20AM714	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. Learn the Architecture of Games Understand the association of functions, relations, partial ordered set and lattices with problems related to theoretical computer science and network models.
2. Describe the Architecture of Game Playing, Apply the use of Equilibrium in Games.
3. Study the Concepts of extensive games
4. Illustrate the mixed strictly competitive games and ratiolzability.
5. Explain the application of Game theory.

UNIT - I

**Contact
Hours**

INTRODUCTION; STRATEGIC GAMES

15

What is game theory? Four elements, Classification of games, The theory of rational choice; Interacting decision makers, Strategic games; Example: The prisoner's dilemma; Nash equilibrium; Examples of Nash equilibrium; Best- response functions; Dominated actions; Equilibrium in a single population: symmetric games and symmetric equilibria, Interpretation of Nash Equilibrium

Games Theory.

Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

MIXED STRATEGY EQUILIBRIUM

Introduction; Strategic games in which players may randomize; Mixed strategy Nash equilibrium; Finding mixed strategy by graphical method; Finding mixed strategy by analysing subset of all actions; Dominated actions; Pure equilibria when randomization is allowed, examples; The formation of players beliefs; Eliminating dominated actions, Median Voter theorem.

UNIT - II	
<p>EXTENSIVE GAMES</p> <p>Extensive games with perfect information; Strategies and outcomes; Nash equilibrium; Subgame perfect equilibrium; Finding subgame perfect equilibria of finite horizon games.</p> <p>EXTENSIONS Allowing for simultaneous moves, examples, Discussion: subgame perfect equilibrium and backward induction.</p> <p>STRICTLY COMPETITIVE GAMES AND MAXIMIZATION</p> <p>Maximization and Nash equilibrium; Strictly Competitive Games; Maximization and Nash equilibrium in strictly competitive games</p> <p>RATIONALIZABILITY</p> <p>Iterated elimination of strictly dominated actions; Iterated elimination of weakly dominated actions; Dominance solvability.</p>	16
UNIT - III	
<p>APPLICATIONS OF GAME THEORY</p> <p>Assumptions and issues in Game theory, Mechanism design problem and examples gametheoryandcryptography,gametheoryandwirelessAdhocnetworks,gametheoryandnetworksecurity,Paretooptimal,Selfishrouting, Correlatedequilibrium</p> <p>Game Theory and Adversarial Machine Learning and Its applications</p> <p>Adversarial learning and its connection to game theory, Game-theoretic models for security and robustness in machine learning, Strategies for defending against adversarial attacks</p> <p>Game Theory in Recommender Systems</p> <p>Modelling user-item interactions as strategic games, Collaborative filtering and matrix factorization techniques, Game-theoretic approaches to recommendation generation and personalization.</p> <p>Game Theory in Online Advertising</p> <p>Auction mechanisms for online advertising, Sponsored search auctions and bidding strategies, Revenue optimization and game-theoretic analysis in ad platforms</p>	08

Course Outcomes:

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

1. Understand the Architecture of Games
2. Analyse the Architecture of Game Playing, Apply the use of Equilibrium in Games
3. Apply the Concepts of extensive games
4. Apply the mixed strictly competitive games and rationally.
5. Understand the application of Game theory.

TEXTBOOKS:

1. Martin Osborne: An introduction to game theory, Oxford University Press, Indian Edition, 2004.
2. An Introduction to Game Theory: Strategy, Joel Watson, W W Norton and Company.
3. Algorithmic Game Theory, Noam Nisan, Tim Roughgarden, Eva Tardos, Vijay V Vazirani, Cambridge University Press.

REFERENCE BOOK:

1. Roger B Myerson: Game theory: Analysis of Conflict, Harvard University Press, 1997.

Table 1: Mapping Levels of COs to POs**1: Low, 2: Medium, 3: High**

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

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1,2	1.1.1,1.3.1, 1.4.1, 2.1.3	L3
CO2	1,2,4	1.1.1,1.3.1,1.4.1, 2.1.3, 2.3.1, 2.4.1, 4.3.1,4.3.3,4.3.4	L4
CO3	1,2,4	1.1.1,1.3.1,1.4.1, 2.1.3, 2.3.1, 2.4.1, 4.3.1,4.3.3,4.3.4	L4
CO4	1,2,5	1.3.1, 1.4.1, 2.1.3, 5.1.1	L2
CO5	1,2,4,5	1.3.1, 1.4.1, 2.1.2, 2.1.3, 2.4.1, 2.3.1, 2.4.1, 4.3.1, 4.3.3, 4.3.4, 5.1.1	L4

OPERATIONS RESEARCH			
Course Code	20AM715	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
<u>Course Learning Objectives:</u>			
This Course will enable students to:			
<ol style="list-style-type: none"> 1. Describe the scope and limitations of OR methods and outline the role of OR techniques in supporting the decisions. 2. Explain the concept of Linear Programming Model (LPM) and formulate Linear Programming problems. 3. Describe the various methods like Simplex Method, revised simplex Method, Big M Method, Two Phase Method, Dual Simplex Method and duality theory and use it on Linear Programming Problems. 4. Describe the formulation of Transportation problems, different methods in Transportation problems like North West Corner Rule, Row minima method, Column minima method, Matrix minima method, Vogel's approximation method, U-V method and use those methods on the respective real-world problems. 5. Describe the formulation of Assignment problems, use Hungarian method in Assignment problems, CPM and PERT (project management techniques) and use it on the respective real-world problems 			
UNIT - I			Contact Hours
INTRODUCTION			15
Introduction to OR, nature and meaning, applications, modeling in OR, phases of OR study			
LINEAR PROGRAMMING			
Introduction to Linear Programming through an example, graphical method, formulation of LP model from practical problems, assumptions and properties of linear programming, simplex method, Big M method, 2 phase method, Revised simplex method, Duality theory, Primal and dual relationship.			
<i>(Text Book-1: Chapter 2,3,5,6,7,8)</i>			
UNIT - II			
TRANSPORATION PROBLEMS			15
Transportation problems, methods to find initial feasible solution and modification to			

<p>obtain optimal solution (Degeneracy in transportation problems, unbalanced transportation problems)</p> <p>ASSIGNMENT PROBLEM</p> <p>Mathematical formulation of an assignment problem, unbalanced assignment problem, Travelling Salesman Problem (TSP), Hungarian method.</p> <p><i>(Text Book-1: Chapter 15,16)</i></p>	
UNIT - III	
<p>CPM, PERT</p> <p>Representation of a project by a network, activities and events, starting times, finishing times, floats, slacks, CPM, Idea of crashing probabilistic times and PERT analysis</p> <p><i>(Text Book-1: Chapter 31)</i></p>	9
<p><u>Course Outcomes:</u></p> <p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> 1. Describe the basics of OR, modelling and applications of OR and the linear programming model. 2. Construct linear programming problem and apply methods like Simplex method, revised simplex method, Big M method, 2 phase method and Dual simplex method to solve the different use cases of linear programming problem. 3. Apply the North West Corner Rule, Row minima method, Column minima method, Matrix minima method, Vogel's approximation method and U-V method to solve the Transportation Problems. 4. Apply the Hungarian method to solve the Assignment Problems and Travelling Salesman Problems. 5. Apply the CPM and PERT project management techniques on the respective use cases to solve the problems related to the use cases. 	
<p>TEXTBOOK:</p> <ol style="list-style-type: none"> 1. Operations Research, S. D. Sharma, 17th Revised edition, 2014. <p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Operations Research, Er. Premkumar Gupta, Dr. D.S. Hira, 4th edition, 2015. 2. Introduction to Operations Research - A Computer Oriented Algorithmic Approach, Gillett B G, McGraw Hill, 2008. 3. Operations Research – An introduction, Hamdy A Taha, PHI, 8th edition, 2007. 	

E-Books / Online Resources:

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

MOOCs:

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

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

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	PO1, PO2, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3, 5.1.1	L3
CO2	PO1, PO2, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3
CO3	PO1, PO2, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3
CO4	PO1, PO2, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3
CO5	PO1, PO2, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1, 5.3.1	L3

MOBILE APPLICATION DEVELOPMENT (Effective from the academic year 2023 -2024) SEMESTER – VII			
Course Code	20AM721	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:			
<ol style="list-style-type: none"> 1. Learn about the features and installation of Flutter 2. Learn about the basic programming constructs of Dart 3. Develop simple mobile applications in Flutter using Dart language 4. Develop mobile applications using database Connections 			
UNIT - I			Contact Hours
Introduction to Flutter Features of Flutter- Advantages of Flutter, Disadvantages of Flutter, Flutter Installation -Installation in Windows, Installation in Mac OS, Creating Simple Application in Android Studio, Architecture of Flutter Applications- Widgets, Gestures, Concept of State, Layers, Introduction to Dart Programming-Variables and Data types, Decision Making and Loops, Functions, Object Oriented Programming. Introduction to Widgets- Widget Build Visualization, Introduction to Layouts- Type of Layout Widgets, Single Child Widgets, Multiple Child Widgets, Advanced Layout Application, Introduction to Gestures, State Management in Flutter- Ephemeral State Management, Application State - scoped model			15
UNIT - II			
Animation on Flutter Navigation and Routing, Introduction to Animation Based Classes, Work flow of the Flutter Animation, Working Application, Android Specific Code on Flutter, Introduction to Package- Types of Packages, Using a Dart Package, Develop a Flutter Plugin Package, Accessing Rest API- Basic Concepts, Accessing Product service API			15
UNIT – III			
Database Concepts SQLite, Cloud Fire store, Internalization on Flutter- Using intl Package, Testing on Flutter- Types of Testing, Widget Testing, Steps Involved, Working Example, Deployment- Android Application, IOS Application, Flutter Development Tools- Widget Sets, Flutter Development with Visual Studio Code, Dart Dev Tools- Flutter SDK			9

Course Outcomes:

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

CO1: Install Flutter in Android Studio

CO2: Build simple Flutter application using simple widgets and layouts

CO3: Build Animation on Flutter

CO4: Develop Flutter applications using Dart packages

CO5: Construct Flutter application using database

TEXTBOOKS:

1. Beginning App Development with Flutter: Create Cross-Platform Mobile Apps 1st ed. Edition, [Rap Payne](#), Apress publication.
2. Beginning Flutter: A Hands On Guide to App Development, [Marco L. Napoli](#)

REFERENCE BOOKS:

1. Flutter Application Development By Android ATC Team

E Books / MOOCs/ NPTEL:

- 1) <https://www.udemy.com/course/flutter-dart-the-complete-flutter-app-development-course>

BIO INFORMATICS			
Course Code	20AM722	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>Bioinformatics and Computational Biology, Nature & Scope of Bioinformatics. The central dogma of molecular biology and bio-sequences associated with it, RNA classification –coding and non coding RNA- mRNA, tRNA, miRNA and sRNA, RNAi. DNA and RNA structure – Nucleic Acid structure and function, Genetic Code, Genes and Evolution</p> <p>Importance of databases - Biological databases-primary sequence databases, Composite sequence databases- Secondary databases- nucleic acid sequence databases - Protein sequence data bases - structure databases, Types of databases, Data retrieval tools – Entrez</p>			15
UNIT - II			
<p>Sequence alignment – local/global, pairwise sequence alignment, scoring methods. Needleman and Wunsch algorithm, global and local alignments. Multiple sequence alignment. Scoring matrices: basic concept of a scoring matrix, Matrices for nucleic acid and proteins sequences, PAM and BLOSUM series, principles based on which these matrices are derived. Differences between distance & similarity matrix.</p> <p>Introduction, Advantages, Phylogenetic Trees, Tree topologies, Methods for phylogenetic analysis- Distance Matrix methods, Character based methods. HMM (Hidden Markov Model): Introduction to HMM, Forward algorithm, Viterbi</p>			15

algorithm, applications in Bioinformatics	
UNIT - III	
General introduction to Gene expression in prokaryotes and eukaryotes Protein and RNA structure Prediction: Predicting RNA secondary structure - Nussinov Algorithm, Energy minimisation methods - Zuker Algorithm. Amino Acids, Polypeptide Composition, Protein Structures, Algorithm for protein folding, Structure prediction	09
<u>Course Outcomes:</u>	
Upon completion of this course, students will be able to:	
<ol style="list-style-type: none"> 1. Understand the concepts of bioinformatics 2. Identify different types of biological sequence 3. Analyse multiple sequences and find conserved regions 4. Understand RNA and Protein folding 	
TEXTBOOKS:	
<ol style="list-style-type: none"> 1. S C Rastogi, N Mendiratta and P Rastogi, " Bioinformatics: Methods and Applications", New Delhi,2015. 2. D E Krane and M L Raymer, Fundamental Concepts of Bioinformatics, 2006. 	
REFERENCE BOOK:	
<ol style="list-style-type: none"> 1. Andreas D.Baxevanis, B F Francis Ouellette, "Bioinformatics - A Practical Guide to the Analysis of Genes and Proteins", Third Edition, 2. Neil C Jones and Pavel A Pevzner, An Introduction to Bioinformatics Algorithms, MITpress, 2004. 	

SYSTEM MODELLING AND SIMULATION			
Course Code	20AM723	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: When simulation is the appropriate tool and when it is not appropriate, Advantages and disadvantages of Simulation; Areas of application, Systems and system environment; Components of a system; Discrete and continuous systems, Model of a system; Types of Models, Discrete-Event System Simulation Simulation examples: Simulation of queuing systems. General Principles.</p> <p>Statistical Models in Simulation: Review of terminology and concepts, Useful statistical models, Discrete distributions. Continuous distributions, Poisson process, Empirical distributions.</p> <p>Queuing Models: Characteristics of queuing systems, Queuing notation, Long-run measures of performance of queuing systems, Long-run measures of performance of queuing systems, Steady-state behavior of M/G/1 queue, Networks of queues,</p>			15
UNIT - II			
<p>Random-Number Generation: Properties of random numbers; Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for Random Numbers,</p> <p>Random-Variate Generation:, Inverse transform technique Acceptance-Rejection</p>			15

<p>technique.</p> <p>Input Modeling: Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, Fitting a non-stationary Poisson process, Selecting input models without data, Multivariate and Time-Series input models.</p>	
<p style="text-align: center;">UNIT - III</p> <p>Estimation of Absolute Performance: Types of simulations with respect to output analysis, Stochastic nature of output data, Measures of performance and their estimation, Measures of performance and their estimation, Output analysis for terminating simulations, Output analysis for steady-state simulations.</p> <p>Verification, Calibration And Validation: Optimization: Model building, verification and validation, Verification of simulation models, Verification of simulation models, Calibration and validation of models, Optimization via Simulation.</p>	09
<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. Explain the system concept and apply functional modeling method to model the activities of a static system 2. Describe the behavior of a dynamic system and create an analogous model for a dynamic system; 3. Simulate the operation of a dynamic system and make improvement according to the simulation results. 	
<p>TEXTBOOK:</p> <p>Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5 th Edition, Pearson Education, 2010.</p> <p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson Education, 2006. 2. Averill M. Law: Simulation Modeling and Analysis, 4 th Edition, Tata McGraw-Hill, 2007 	

LARGE LANGUAGE MODELS AND PROMPT ENGINEERING WITH GPT3			
Course Code	20AM724	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 Transformers: Motivation behind transformers, Self-attention mechanism, Transformer architecture and components</p> <p>Pretrained language models (PLMs): Introduction to PLMs, Transformer based models: BERT, Fine tuning, and transfer learning with PLMs</p> <p>Introduction to Large language models: What are large language models, Popular modern LLMs, Domain specific LLMs, Applications of LLMs</p>			15
UNIT – II			
<p>Prompt Engineering with GPT3: Introduction, Prompt engineering, working with prompts across models, Building Q/A bot with GPT</p> <p>Optimizing LLMs with Customized Fine Tuning: Introduction, Transfer learning and fine tuning, OpenAI Fine tuning API, Amazon Review category classification</p> <p>Advanced Prompt Engineering: Introduction, Prompt engineering, Introduction, Prompt injection attacks, Input/Output Validation, Batch Prompting, Prompt Chaining, chain of thought prompting, Testing and Iterative prompt development.</p>			15
UNIT – III			
<p>Hugging Face: Introduction, Features of hugging face platform, Components of hugging face, Pipelines</p> <p>Tasks using hugging face library: Introduction to Gradio, Creating a space on hugging face,</p>			09

Hugging face tasks															
Course Outcomes:															
Upon completion of this course, students will be able to:															
<ol style="list-style-type: none"> 1. Learn details on transformers and BERT models 2. Illustrate how pretrained models work 3. Apply prompt engineering with GPT3 and optimizing LLMs 4. Describe advanced prompt engineering 5. Learn about hugging face and hugging face library 															
TEXTBOOKS:															
<ol style="list-style-type: none"> 1. “Quick Start Guide to Large Language Models: Strategies and Best Practices for using ChatGPT and Other LLMs” by Sinan Ozdemir, O’reilly publications, October 2023 2. “Introduction to Transformers for NLP: With the Hugging Face Library and Models to Solve Problems” by Shashak mohan Jain, O’reilly publications, October 2022 															
REFERENCE BOOKS:															
<ol style="list-style-type: none"> 1. “Mastering Transformers: Build state-of-the-art models from scratch with advanced natural language processing techniques” by Savas Yildirim, Meysam Asgari-Chenaghlu, 2022 2. “Learning Deep Learning: Theory and Practice of Neural Networks, Computer Vision, Natural Language Processing, and Transformers Using TensorFlow” by Magnus Ekman, October 2021 															
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		2				2	2			2		
CO2	3	2	2		2				2	2			2		
CO3	3	2	2		2				2	2			2		
CO4	3	2	2		2				2	2			2		
CO5	3	2											2		

Table 2: Mapping of Cos to PIs, Pos and BTL			
Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1, 9.1.1, 10.1.1	L2, L3
CO2	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1, 9.1.1, 10.1.1	L2, L3
CO3	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3,5.1.1, 9.1.1, 10.1.1	L2, L3
CO4	1, 2, 3, 5, 9, 10	1.3.1,1.4.1, 2.1.3, 5.1.2, 9.1.1, 10.1.1	L2, L3
CO5	1, 2	1.3.1,1.4.1, 2.1.3	L2

TEXT MINING			
Course Code	20AM725	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>			
<ol style="list-style-type: none"> 1. Design text extraction techniques. 2. Design clustering techniques for text. 3. Design classification techniques for text 4. Practice visualization methodologies using tools. 5. Practice feature extraction using tools 			
UNIT - I			Contact Hours
Text Extraction Text Extraction: Introduction, Rapid automatic keyword extraction: candidate keywords, keyword scores, adjoining keywords, extracted keywords, Benchmark evaluation: precision and recall, efficiency, stoplist generation, Evaluation on new articles.			15
Clustering Clustering: Multilingual document clustering: Multilingual LSA, Tucker1 method, PARAFAC2 method, LSA with term alignments, LMSA, LMSA with term alignments.			
UNIT - II			
Classification: Content-based spam email classification using machine-learning algorithms, Utilizing nonnegative matrix factorization for email classification problems, Constrained clustering with k-means type algorithms.			16
Anomaly and trend detectionAnomaly and trend detection: Text Visualization techniques such as tag clouds, authorship and change tracking, Data Exploration and the search for noval patterns, sentiment tracking, visual analytics and FutureLens, scenario discovery, adaptive threshold setting for novelty mining.			
UNIT - III			
Text streams Text streams: Introduction, Text streams, Feature extraction and data reduction, Event detection, Trend detection, Event and trend descriptions, Embedding			08

semantics in LDA topic models: Introduction, vector space modeling, latent semantic analysis, probabilistic latent semantic analysis, Latent Dirichlet allocation, embedding external semantics from Wikipedia, data-driven semantic embedding.

Course Outcomes:

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

1. Design text extraction techniques.
2. Design clustering techniques for text.
3. Design classification techniques for text
4. Practice visualization methodologies using tools.
5. Practice feature extraction using tools

TEXTBOOKS:

1. Michael W. Berry & Jacob Kogan , "Text Mining Applications and Theory", Wiley publications.
2. Aggarwal, Charu C., and ChengXiangZhai, eds. Mining text data. Springer Science & Business Media, 2012.

REFERENCE BOOK:

1. Miner, Gary, et al. Practical text mining and statistical analysis for non-structured text data applications. Academic Press, 2012.
2. Srivastava, Ashok N., and Mehran Sahami. Text mining: Classification, clustering, and applications. Chapman and Hall/CRC, 2009.
3. Buitelaar, Paul, Philipp Cimiano, and Bernardo Magnini, eds. Ontology learning from text: methods, evaluation and applications. Vol. 123. IOS press, 2005.

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

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1,2	1.3.1, 1.4.1, 2.2.5	L2
CO2	1,2	1.3.1, 1.4.1, 2.2.5	L2
CO3	1,2	1.3.1, 1.4.1, 2.1.3,	L2
CO4	1,2	1.3.1, 1.4.1, 2.1.3,	L3
CO5	1,2	1.3.1, 1.4.1, 2.1.3, 2.2.5	L3

CRYPTOGRAPHY AND CYBER SECURITY

Course Code	20AM811	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03

Credits – 4**Course Learning Objectives:**

This Course will enable students to:

1. Analyze the principles and underlying mathematical theory of cryptography and classical encryption techniques.
2. Select appropriate data encryption techniques and apply them to solve a given problem.
3. Get the idea of various public key cryptosystems.
4. Analyze the fundamentals of cyber security and its essentials.
5. Describe various actions and motivations of attackers, involved in the cyber threat.

UNIT - I	Contact Hours
<p>Classical Encryption Techniques: Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad.</p> <p>Block Ciphers and The Data Encryption Standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, DES, Block cipher design principles, number of rounds, Design of function F, key schedule algorithm, AES algorithm introduction.</p> <p>Public-Key Cryptography and RSA: Principles of Public-key cryptosystems. Public-key cryptosystems. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA.</p>	15
UNIT - II	
<p>Other Public-Key Cryptosystems: Diffie-Hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, Elliptic curve cryptography, Analog of Diffie-Hellman key exchange, Elliptic curve encryption/decryption.</p> <p>Cyber Security Fundamentals: Information Assurance Fundamentals: Authentication, Authorization, Nonrepudiation, Confidentiality, Integrity, Availability; Basic Cryptography; Symmetric Encryption: Example of Simple Symmetric Encryption with Exclusive OR (XOR) and Improving upon Stream Ciphers with Block Ciphers; Public Key Encryption; The Domain Name System (DNS) : Security and the DNS; Firewalls: History Lesson, What's in a Name? Packet-Filtering Firewalls, Stateful Firewalls, Application Gateway Firewalls</p>	15
UNIT - III	
<p>Attacker Techniques And Motivations:</p> <p>How Hackers Cover Their Tracks (Antiforensics): How and Why Attackers Use Proxies, Types of Proxies, Detecting the Use of Proxies, Tunneling Techniques - HTTP, DNS, ICMP, Intermediaries, Steganography, and Other Concepts, Detection and Prevention; Fraud Techniques : Phishing, Smishing, Vishing, and Mobile Malicious Code - Mobile Malicious Code, Phishing against Mobile Devices; Rogue Antivirus - Following the Money: Payments; Click Fraud - Pay-per-Click, Click Fraud Motivations, Click Fraud Tactics and Detection. Threat Infrastructure: Botnets, Fast-Flux, Advanced Fast-Flux.</p>	9

Course Outcomes:

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

1. Comprehend the cryptography techniques.
2. Apply the Knowledge of number theory in public key crypto systems.
3. Analyze and determine various public key cryptosystems.
4. Explain the requirements of the cyber security and various methods to provide the security to the computer networks.
5. Determine the various actions and motivations of attackers, involved in the cyber threat.

TEXTBOOKS:

1. William Stallings: Cryptography and Network Security, Pearson 6th Edition, 2013.
2. Cyber security essentials --Edited by James Graham, Richard Howard, Ryan Olson, publication: CRC press, Taylor and Francis group, 2011.

REFERENCE BOOKS:

1. V K Pachghare: Cryptography and Information Security, PHE, 2013.
2. Yuri Diogenes, Erdal Ozkaya, "Cybersecurity - Attack and Defense Strategies: Infrastructure security with Red Team and Blue Team tactics (Kindle Edition)".
3. Joseph carson, "Cybersecurity for Dummies", CISSP
4. Scott Augenbaum, "The Secret to Cybersecurity A Simple Plan to Protect Your Family and Business from Cybercrime".
5. Cyber Security –Nina godbole, SUNIT Belapure, Publication: John Wiley, 2012.

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

Table 2: Mapping of COs to PIs, POs and BTL			
Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1,2,3,4,5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 4.1.1,4.1.2,5.1.1,5.2.1,5.2.2,5.3.1	L2
CO2	1,2,3,4,5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 4.1.1,4.1.2,5.1.1,5.2.1,5.2.2,5.3.1	L3
CO3	1,2,3,4,5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 4.1.1,4.1.2,5.1.1,5.2.1,5.2.2,5.3.1	L2
CO4	1,2,3,5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2
CO5	1,2,3,5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2

REINFORCEMENT LEARNING			
Course Code	20AM812	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: Reinforcement learning, elements of reinforcement learning, limitations, and scope</p> <p>Finite Markov decision processes: The agent environment interface, Goals and Rewards, Returns and Episodes, Unified Notation for episodic and continuing tasks, Policies and value functions, Optimal policies and optimal value functions, Optimality and Approximation</p> <p>Dynamic Programming: Policy evaluation (prediction), policy improvement, policy iteration, value iteration, Asynchronous dynamic programming, generalized policy iteration, efficiency of dynamic programming</p>			15
UNIT - II			
<p>Monte Carlo Methods: Monte Carlo prediction, Monte Carlo estimation of action values, Monte Carlo control, Monte Carlo Control without exploring starts, Off-policy prediction via importance sampling, incremental implementation, off-policy Monte Carlo Control</p> <p>Temporal Difference Learning: TD prediction, Advantages of TD Prediction Methods, Optimality of TD(0), Sarsa: On-Policy TD Control, Q-learning: Off-policy TD Control, Expected Sarsa, Maximization Bias and Double Learning,</p>			15
UNIT - III			
<p>On-Policy prediction with Approximation: Value function approximation, The prediction objective, Stochastic gradient and Semi-gradient methods, Linear methods, Feature construction for Linear Methods: Polynomials, Fourier Basis, Coarse Coding, Tile Coding, Radial Basis Functions</p>			9

Course Outcomes:

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

1. Learn details on reinforcement learning, and its elements with Markov decision process
2. Illustrate reinforcement learning with dynamic programming
3. Apply Monte Carlo methods on different reinforcement applications
4. Describe temporal difference learning and Q learning
5. Learn concepts on policy prediction with approximation

TEXTBOOK:

1. “Reinforcement learning-an introduction” by Richard Sutton and Andrew G Barto, second edition, MIT press, 2018

REFERENCE BOOKS:

1. “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems”, Third Edition by Aurelien Georon, 2022
2. “TensorFlow for Deep Learning: From Linear Regression to Reinforcement Learning” by Barath Ramsundar, Reza Bosagh Zadeh, April 2018

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

Table 2: Mapping of Cos to PIs, Pos and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1, 2, 3, 5	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1	L2, L3
CO2	1, 2, 3, 5	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1	L2, L3
CO3	1, 2, 3, 5	1.3.1,1.4.1, 2.1.3, 5.1.1	L2, L3
CO4	1, 2, 3, 5	1.3.1,1.4.1, 2.1.3, 5.1.2	L2, L3
CO5	1, 2	1.3.1,1.4.1, 2.1.3	L2

BUSINESS INTELLIGENCE			
Course Code	20AM813	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
INTRODUCTION TO BUSINESS INTELLIGENCE:			15
Types of digital data; Introduction to OLTP, OLAP and Data Mining; BI Definitions&Concepts;BusinessApplicationsofBI;BIFramework,Roleof Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles &Responsibilities.			
Basics of Data Integration (Extraction Transformation Loading); Concepts of data integration; Need and advantages of using data integration; Introduction to common data integration approaches;			
Introduction to data quality, data profiling concepts and applications, Data Warehouse and OLAP Technology – Definition, A Multidimensional Data Model, Concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema;			
UNIT - II			
Data Warehouse Architecture. Introduction to data and dimension modeling, multidimensional data model, ER Modelling vs. multi dimensional modeling; Introduction to business metrics and KPIs; Introduction to enterprise reporting; Concepts of dashboards, balanced scorecards; Applications of Data mining and Case studies of BI.			16
Data Mining — On What Kind of Data? Data Mining Functionalities - What Kinds of Patterns Can Be Mined? Mining Association rules: Basic concepts, frequent item set mining methods. Definitions of classification, prediction and clustering;			
UNIT - III			
Classification and Prediction - Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Prediction, Cluster Analysis - Types of Data in Cluster Analysis, Hierarchical Methods.			08

Course Outcomes:

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

1. Identify the source and distinguish the data based on its type for a business application.
2. Identify various roles in a BI application and Design the ETL process for handling the data from a given application.
3. Apply the data ware housing concepts for a business application and Design a star / snowflake schema for a multi dimensional data of a given problem.
4. Illustrate the data mining concepts and association rules with suitable examples.
5. Apply classification, prediction and clustering concepts to various applications.

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Carlo Vercellis “Business Intelligence Data mining and Optimization for Decision Making”, Wiley,2009
2. Uddagiri Chandrasekhar, S. K. Shinde, “Data Mining and Business Intelligence”, DreamtechPress,2015.

DISTRIBUTED SYSTEMS			
Course Code	20AM814	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 distributed systems: Fundamentals: -What is Distributed Computing Systems? Distributed Computing System Models, what is DOS? Issues in designing a DOS.</p> <p>Remote Procedure Calls: The RPC model, Transparency of RPC, Implementing RPC mechanism, Stub generation, RPC messages, Marshaling Arguments and results. Server management, Parameter passing semantics, call semantics, communication protocols RPC's. Complicated RPCs, Client –server binding, Exception handling, Security. Synchronization in distributed Systems: Clock synchronization – logical clocks – physical clocks – clock synchronization algorithms, Mutual exclusion – A centralized algorithm – A distributed algorithm – a token ring algorithm, Comparison of the three algorithms, Election algorithms – the Bully algorithm – ring algorithm.</p>			15
UNIT - II			Contact Hours
<p>Synchronization in distributed Systems: Dead locks in distributed systems – distributed deadlock avoidance algorithms – distributed deadlock prevention algorithms, distributed deadlock detection algorithms: Centralized approach, Hierarchical approach and Fully distributed approach.</p> <p>Process Migration: Desirable Features of a Good Migration Mechanism, Process Migration Mechanisms, Threads: Introduction, Motivation for using Threads, Models for Organizing Threads, Issues in Designing Threads Package, Implementing Thread Package. Distributed Shared Memory: General structure, Design and implementation issues of DSM, Granularity, Structure of shared memory space, Consistency Models, Replacement Strategy, Thrashing.</p>			16

UNIT - III

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

08

Course Outcomes:

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

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

TEXTBOOK:

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

REFERENCE BOOKS:

1. Lampson (Ed), Distributed Systems, Singer – Verlay NY 1981.
2. Mukesh Singhal, Niranjana G, "Advanced Concepts in Operating Systems", Tata McGraw-Hill Education, 2001.

MOOCs:

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

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

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

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

HIGH PERFORMANCE COMPUTING
(Effective from the academic year 2023 -2024)
SEMESTER – VIII

Course Code	20AM815	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:

1. Define the need of graphical processing UNIT
2. Learn the simple CUDA programs
3. Show the memory model and GPU interaction with CPU
4. Describe the use of Memory hierarchy
5. Understand the usage of tools and programming.

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: NVIDIAG80,GT200,Fermi,AMD Radeon, AMD Fusion APU etc.</p> <p>Execution Model: Features of CUDA and OpenCL, Comparison of CUDA andOpenCL,Threadorganization,Kernel,errorhandling,andexecutionin CUDA andOpenCL</p>	15
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:

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

1. Understand the need of graphical processing UNIT
2. Write simple CUDA programs
3. Analyse the memory model and GPU interaction with CPU
4. Describe the use of Memory hierarchy
5. Understand the usage of tools and programming.

TEXTBOOKS:

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:

1. T.Mattson, etal. Patterns of ParallelProgramming, 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 PerhaadMistry, Heterogeneous Computing with OpenCL,2011.

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

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	P1, P2, P3, P5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2
CO2	P1, P2, P3, P5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2
CO3	P1, P2, P3, P5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2
CO4	P1, P2, P3, P5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2
CO5	P1, P2,P3, P5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2

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																																																																																																									
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1. BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., 2007																																																																																																																							
2. Kankanala C., Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd., 2007																																																																																																																							
3. Subbaram N.R. "Handbook of Indian Patent Law and Practice", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.																																																																																																																							
4. Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.																																																																																																																							
5. Intellectual Property Today: Volume 8, No. 5, May 2001,																																																																																																																							
6. WTO and International Trade by M B Rao. Vikas Publishing House Pvt. Ltd.																																																																																																																							
7. Correa, Carlos M. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options, Zed Books, New York 2000																																																																																																																							
8. Wadehra, B. L. Law relating to patents, trademarks, copyright designs & geographical indications 2 ed. Universal Law Publishing 2000																																																																																																																							
9. Sinha, Prabhas Chandra Encyclopedia of Intellectual Property Rights, 3 Vols. Eastern Book Corporation, 2006.																																																																																																																							
10. "Practical Approach to Intellectual Property Rights"; Rachna Singh Puri and Arvind Vishwanathan, I. K. International Publishing House Pvt. Ltd.																																																																																																																							
E-RESOURCES:																																																																																																																							
1. http://www.w3.org/IPR/																																																																																																																							
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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 Pyrheliometer.

5 Hours

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

4 Hours

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

4 Hours

UNIT – II

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

4 Hours

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

4 Hours

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

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

6 Hours

UNIT – III

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

5 Hours

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

4 Hours

Course Outcomes:

At the end of the course student will be able to

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

Course Outcomes: Mapping with Program Outcomes												
Program Outcomes→	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→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
	↓ Course Outcomes												1	2
CO1		3							3	3		3		
CO2		2						3	2	3		2		
CO3		3							2	2		3		
CO4		3							2	2		3		
CO5		2							3	3		2		
1: Low 2: Medium 3: High														
REFERENCE MATERIALS:														
1.	Geetha.V. Gender. Kolkatta: Web Impressions, 2009.													
2.	Bailey, Jane, et al. "Negotiating with Gender Stereotypes On Social Networking Sites: From "Bicycle Face" to Facebook." Journal of Communication Enquiry 37.2 (2013): 91-112.													
3.	Barry, Peter. Beginning Theory. New Delhi: Viva Books, 2010.													
4.	Berger, John. Ways of Seeing. London: Penguin Books, 1977.													
5.	Cranny-Francis, Anny, et al. Gender Studies: Terms and Debates. New York: Palgrave Macmillan, 2003.													
6.	Gauntlett, David. Media, Gender and Identity: An Introduction. London: Routledge, 2008													
7.	Pilcher, Jane, and Imelda Whelehan. 50 Key Concepts in Gender Studies. London: Sage, 2004. Print.													
8.	Jeanne, Haraway Donna. Simians, Cyborgs, and Women. London: Free Association Books, 1991. Web.													
9.	Koskela, Hille. "Webcams, TV Shows and Mobile Phones: Empowering Exhibitionism." Surveillance & Society 2.3 (2004): 199-215. Web.													
E-RESOURCES:														
1.	http://www.cyberpsychology.eu/view.php?cisloclanku=2009061501/ >.													
2.	http://www.surveillance-and-society.org/articles2(2)/webcams.pdf													
3.	http://eprints.rclis.org/19790/ >.													

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

1: Low 2: Medium 3: High

REFERENCE MATERIALS:

1. 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 COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C8X38.1	1	2	1											
C8X38.2	1	2	1										2	2
C8X38.3	1	2	2										2	3
C8X38.4	1	2	2										2	3
C8X38.5	1	2	2										2	3

(L/1=Low30%-49%,M/2=Medium50%-69%,H/3=High>70%)

TEXTBOOK:

- 1) Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705

ADDITIONAL RESOURCES:

1. Think Python. PDF is free.

SEE Question Paper Pattern:

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

BIOFUEL ENGINEERING			
Course Code	20BT8X40	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Prerequisites: Nil

Co-requisites: Nil

Course Learning Objectives:

The objective of this course is

- To learn the fundamental concepts of biofuels, types of biofuels, their production technologies.
- To learn the concepts of feedstock utilization and energy conversion technologies.

UNIT – I

LIQUID BIOFUELS

Description and classification of Biofuels; Primary biomass: Plant materials-Woody biomass, Lignocellulosic and agroindustrial by-products, starchy and sugary crops. Secondary biomass: Waste residues and co-products-wood residues, animal waste, municipal solid waste. Biomass production for fuel – algal cultures, yeasts (Lipid and carbohydrate).

Production of biodiesel: Sources of Oils – edible and non edible; Esterification and Transesterification. Free fatty acids; saponification; Single step and two step biodiesel production. Catalysts for biodiesel production – homogeneous (alkali/acidic) and heterogeneous; Lipase mediated process. General procedure of biodiesel production and purification Quality Control Aspects: GC analysis of biodiesel, fuel property measurements, ASTM (D-6751) and Indian standards (IS15607). Algal Biodiesel production.

Production of Bioethanol: Bioethanol production using Sugar; Starch and Lignocellulosic feedstocks; Pretreatment of lignocellulosic feed stock

15 Hours

UNIT – II

BIOHYDROGEN AND MICROBIAL FUEL CELLS

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

SEE QUESTION PAPER PATTERN:

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

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)

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 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 Bhavde 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→ ↓ Course Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
													1	2
HU1505-1.1						3	3	1						
HU1505-1.2						3	3							
HU1505-1.3									1					

1: Low 2: Medium 3: High

REFERENCE BOOKS:

1. Cadets Handbook, R.K. 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**.

SPACE TECHNOLOGY AND APPLICATIONS			
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 Arthagarike: Ondu Vishleshane: Dr.Ramananda Banari.
2. Yaksha Naatyanjali Thenkuthittu- Sampadaka: Sathish Madivala, Karkala.
3. Yakshagna Shikshana Patya Pustka- Prathamika vibhaga (Karnatka Patya pusthaka sangha- Bengaluru)
4. Koralara: YakshaganaVimarsha Sankalana: Dr.M. Prabhakara Joshi
5. Vaagartha Gawrava: (Dr. Joshi Abhinandana Guchaha): Ga. Na. Bhat

MARKETING MANAGEMENT			
Course Code	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.
