Syllabus of V & VI Semester B.E. / Civil Engg.



College Calendar 2023-24

Department of Civil Engineering



Syllabus of 3rd Year





NMAM INSTITUTE

INOLOGY



Nitte - 574110, Karnataka, India

V & VI SEMESTER Department of Civil Engineering



College Calendar 2023-24

मातेव रक्षति पितेव हिते नियुङ्कते कान्तेव चापि रमयत्यपनीय खेदम् । लक्ष्मी तनॊति वितनॊति च दिक्षु कीर्ति किं किं न साथयति कल्पलतॆव 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। पली की तरह हमारा दु:ख दूर करता है। मन को संतोष देता है, धन देती है, दिशओं में कीर्ति फ़ैलाती 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.

Syllabus of V & VI Semester B.E. / Civil Engg.



(An Autonomous Institution affiliated to VTU, Belgavi) NITTE-574110, Karkala Taluk, Udupi District, Karnataka, India ISO 9001:2015 Certified, Accredited by NAAC with "A" Grade

COLLEGE CALENDAR 2023-24 (V & VI Semester)



Syllabus of V & VI Semester B.E. / Civil Engg.



(An Autonomous Institution affiliated to VTU, Belgavi) NITTE-574110, Karkala Taluk, Udupi District, Karnataka, India ISO 9001:2015 Certified, Accredited by NAAC with "A" Grade

Vision Statement

Pursuing Excellence, Empowering people, Partnering in Community Development

Mission Statement

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









NMAM INSTITUTE OF TECHNOLOGY

	SI.No.	Name of the Faculty	Designation
1	Dr N Niran	ian Chinlunkar	Principal
<u>1</u> . 2	Mr. Voqeesh) Heade	Director(CM&D)
2. 3	Dr Shriniyas	sa Rao B. R	Vice Principal/Controller of
5.			Examinations/Professor
4	Dr I Rames	h Mithanthava	Vice Principal / Dean
1.	Di. i. Kumes	n withantinaya	(Academic)/Professor
5	Dr. Sudesh I	Bekal	Dean (B&D)/Professor
5. 6	Dr Raiesh S	hetty K	Dean (Admissions)/Professor
7.	Dr. Rekha Bl	handarkar	Deputy Registrar of Nitte Off-campus
	2.1.101.102.21		Centre. Nitte (DU)
8.	Dr. Subrahm	nanya Bhat K	Deputy COE of Nitte Off-campus Centre, Nitte (DU)
9.	Dr. Nagesh	Prabhu	Director(Curriculum
			Development) Nitte (DU)
10.	Dr. Srinath Sl	hetty K.	Resident Engineer/Professor
11.	Dr. Narasimh	ia Bailkeri	Dean(Student Welfare)/Professor
12.	Dr. Rajalaksh	mi Samaga BL	PG Coordinator/Professor
<u>HEAD</u>	DS OF DEPART	MENTS	
1.	. Dr. Arun I	Kumar Bhat	HoD, Civil Engg.
2.	. Dr. Jyothi	Shetty	HoD, Comp. Science & Engg
3.	. Dr. Ashwi	ni B	HoD, Information Science & Engg
4	. Dr. Ujwal	Р	HoD, Biotechnology
5.	. Dr. KVSSS	SS Sairam	HoD, E&C Engg.
6	. Dr. Surya	narayana K	HoD, E&E Engg.
7.	. Dr. Mural	idhara	HoD, Robotics & Artificial Intelligence
8	. Dr. Kumu	dakshi	HoD, Mathematics
9.	. Dr. Shobł	na R. Prabhu	HoD, Physics
1	0. Dr. Shivap	orasad Shetty M.	HoD, Chemistry
1	1. Dr. Mama	atha Balipa	HoD, MCA
1.	2. Dr. Vishw	anatha	HoD, Humanities
1	3. Dr. Udaya	a Kumar K Shenoy	HoD, Computer & Communication Engg
14	4. Dr. Shara	da Uday Shenoy	HoD, Artificial Intelligence & Machine Learning

- 15. Dr. Srinivas Pai P
- 16. Dr. Venugopala PS
- 17. Mr. Bharath G Kumar

HoD, Mechanical Engg HoD, Artificial Intelligence & Data Science Head, Training & Placement Cell

Co-ordinator MoUs

1st year Coordinator

Co-ordinator Alumni

Public Relation Officer

Digital Media Executive

Student Welfare Officer

Co-ordinator - Red Cross Unit

Workshop Suptd

Assistant CoE

NCC Officer

INCHARGE OF INSTITUTION'S RESPONSIBILITIES

- 1. Dr. Shashikanth Karinka
- 2. Dr. Gururaj Upadhyaya
- 3. Dr. Joy Elvine Martis
- 4. Dr. Jnaneshwar Pai Maroor
- 5. Dr. Venkatesh Kamath
- 6. Dr. Janardhan Nayak
- 7. Mr. Srinivas Nekkar
- 8. Mr. Krishnaraja Joisa
- 9. Mr. K. Sathish Nayak
- 10. Sri. Shekar Poojari

ENTREPRENEURSHIP DEVELOPMENT CELL

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

DEPARTMENT OF TRAINING & PLACEMENT

1. Mr. Ankith S Kumar Counsellor

DEPARTMENT OF MATHEMATICS

1.	Dr. Shashirekha B. Rai	Professor
2.	Dr. Kumudakshi	Asso. Professor/ HoD
3.	Dr. Sharad M. Hegde	Asst. Professor Gd III
4.	Dr. Vasanth K.R	Asst. Professor Gd III
5.	Dr. Ashwini Kumari	Asst. Professor Gd III
6.	Dr. Chaithra K.	Asst. Professor Gd III
7.	Dr. Prashanthi K S	Asst. Professor Gd III
8.	Dr. Girija K P	Asst. Professor Gd III
9.	Dr. Ganesh Kumar K	Asst. Professor Gd III

10.	Mrs. Ambika N.	Asst. Professor Gd I
11.	Mrs. Vinaya Acharya	Asst. Professor Gd I
12.	Mrs. Anitha D. Bayar	Asst. Professor
13.	Mrs. Bhavya K.	Asst. Professor
14.	Mrs. Bhavya. D.	Asst. Professor
15.	Mrs. Sharmila	Asst. Professor
16.	Mrs. Anjana Pai K	Asst. Professor
17.	Mrs. Soumya	Asst. Professor
18.	Mrs. Smitha G. V.	Asst. Professor

DEPARTMENT OF PHYSICS

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

DEPARTMENT OF CHEMISTRY

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

DEPARTMENT OF HUMANITIES

1.	Dr. Ramakrishna B.	
-		

- 2. Mrs. Rashmi D. Hegde
- 3. Dr. Vishwanatha
- 4. Dr. Jnaneshwar Pai Maroor

Professor Asso. Professor Asso. Professor /HoD Asst. Professor Gd III

Dr. Joy Elvine Martis 5. Asst. Professor Gd III Mrs. Shyla D Mendonca Asst. Professor Gd II 6. 7. Ms. Sonia Lobo Asst. Professor Gd I Ms. Akshatha Kumari J Shetty Asst. Professor Gd I 8. Mr. Srinivas Nekkar Asst. Professor 9. 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
- 2. Mr. Manjunatha Suvarna
- 3. Mr. Rajesh Ballal
- 4. Mrs. Gayathri Kamath
- 5. Mrs. Chethana Sharma
- 6. Mrs. Hema S. Hegde

Sr. Manager, Gents Main Hostel Hostel Manager, Gents Main Hostel Manager, Gents PG Hostel Manager, Ladies PG Hostel Manager, Ladies Main Hostel Superintendent, Hostel Office

Syllabus of V & VI Semester B.E. / Civil Engg.

REGULATIONS

2023-24

(Applicable for admission batch 2021-22 onwards)

Syllabus of V & VI Semester B.E. / Civil Engg.



CONTENTS

REGULATIONS

- 1. INTRODUCTION
- 2. DEGREE PROGRAMMES
- 3. **REGISTRATION**
- 4. ADD/DROP/AUDIT OPTIONS
- 5. COURSE STRUCTURE
- 6. ATTENDANCE REQUIREMENT
- 7. WITHDRAWAL FROM THE PROGRAMME
- 8. EVALUATION SYSTEM
- 9. EVALUATION OF PERFORMANCE
- 10. COMMUNICATION OF GRADES
- 11. VERTICAL PROGRESSION
- 12. AWARD OF CLASS
- 13. APPEAL FOR REVIEW OF GRADES
- 14. AWARD OF DEGREE
- 15. GRADUATION REQUIREMENTS AND CONVOCATION
- 16. AWARD OF PRIZES, MEDALS, CLASS AND RANKS
- 17. CONDUCT AND DISCIPLINE
- 18. EARNING OF ACTIVITY POINTS FOR THE AWARD OF DEGREE
- 19. LISTS OF MAJOR SCHOLARSHIPS

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 ¹/₂ days a week. Suggested Break down of Academic Year into Semesters

1. No. of Semesters / Year	Three; Two being Main semesters (odd, even) and one being a supplementary semester; after 2 main semesters.
	(Note: Supplementary semester is primarily to assist weak and / or
	failed students through make up courses. However, Autonomous
	Colleges may use this semester to arrange Add-On courses for other
	students and / or for deputing them for practical training elsewhere.)
2. Semester Duration	Main semester (odd, even) each 19 Weeks; Supplementary Semester 8 Weeks
3. Academic Activities	Main Semester
(Weeks):	Registration of Courses & Course Work (16.0) Examination Preparation and Examination (3.0)

Total (19)
Supplementary Semester
Registration of Courses & Course Work (5.0)
Examination Preparation and Examination (3.0)
Total (8)
Declaration of results: 2 weeks from the
date of last examination
Inter- Semester Recess:
After each Main Semester (2)
Total Vacation: 10 weeks (for those who
do not register for supplementary
semester) and 4 weeks (for those who
register for supplementary semester)

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

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

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

2. DEGREE PROGRAMMES

2.1	Undergraduate	B.E.	Degree	Programmes	are	offered	in	the	following
	disciplines by th	ne res	pective p	programme ho	sting	ı departm	nent	s list	ed 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)

Oth	er teaching departments are –	
i)	Mathematics	(MA)
ii)	Physics	(PH)
iii)	Chemistry	(CY)
iv)	Humanities, Social Sciences and Management	(HU)

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

3. **REGISTRATION**

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

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

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

Lecture / Tutorials / Practical:

- i) One hour Lecture per week is assigned one Credit.
- ii) 2-hour Tutorial session per week is assigned 1.0 Credit.
- iii) 2-hour Lab. session per week is assigned 1.0 credit.

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

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

Calculation of Contact Hours / Week – A Typical Example

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

3.3 Mandatory Pre-Registration for higher semester

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

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

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

4. ADD / DROP / AUDIT options

4.1 **Registration of courses**

Each student shall have to register for course work at the beginning of a semester within 2 to 3 days of commencement after discussing with subject teacher and under faculty advice. The permissible course load to be either average credits (=20) or to be within the limits of minimum (=15) and maximum (=25) credits.

4.2 **DROP-option**

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

4.3 Withdrawal from courses

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

4.4 **AUDIT-option**

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

5. COURSE STRUCTURE:

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

No.	Course Category	Credit Range			
1.	Basic Science Courses	20-25			
2.	Engineering Science Courses	18-22			
3.	Humanity, Social Science and Management	8-12			
4.	Ability Enhancement Courses	10-14			
5.	Professional Core Courses (PCC)	40-45			
6.	Professional Elective Courses (PEC)	8-12			
7.	Open Elective Courses (OE)	8-12			
8.	Skill Courses (Project Work / Internship / Seminar)	28-36			
9.	Mandatory courses	2			
Note: Student can register between 15 to 25 credits per semester Total Credits to be earned : 160					

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

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

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

5.4 Mandatory Learning Courses

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

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

Courses that come under this category are the following.

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

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

5.5 **PROJECT**

- Project work at 7th semester shall be completed batch wise. The batch shall consist of a maximum of 4 students.
- ii) Project viva-voce examination shall be conducted individually.

5.6 **ELECTIVES**

- $_{\mathfrak{P}}\mathsf{A}$ candidate shall take electives in each semester from groups of electives, commencing from 6^{th} semester.
- ii) The minimum number of students to be registered for any Elective offered shall not be less than ten.
- iii) A candidate shall opt for his/her choice of electives and register for the same if pre-registration is not done, at the beginning of each of 6th & 7th semesters. The candidate is permitted to opt for change of elective within 15 days from the date of commencement of the semester as per the academic calendar of the college.

6. ATTENDANCE REQUIREMENT:

- 6.1 Each semester is considered as a unit and the candidate has to put in a minimum attendance of 85% in each subject with a provision of condoning 10% of the attendance by Principal for reasons such as medical grounds, participation in University level sports, cultural activities, seminars, workshops and paper presentation.
- 6.2 The basis for the calculation of the attendance shall be the period of term prescribed by the College by its calendar of events. For the first semester students, the same is reckoned from the date of admission to the course (as per CET/COMED-K or Management allotment).
- 6.3 The students shall be informed about their attendance position in the first week of every month by the College so that the students shall be cautioned to make up the shortage.
- 6.4 A candidate having shortage of attendance (<75%) in any course(s) registered shall not be allowed to appear for SEE of such course(s).Such students will be awarded 'N' grade in these courses.

He/she shall have to repeat those course(s). Such students shall re-register for the same course(s) core or elective, as the case may be when the particular course is offered next either in a main (odd/even) or supplementary semester.

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

7. WITHDRAWAL FROM THE PROGRAMME

7.1 **Temporary Withdrawal**

- a) A student who has been admitted to a degree programme of the college may be permitted once during the course to withdraw temporarily, for a period of one semester, on the grounds of prolonged illness or grave calamity in the family etc., provided
 - The student applies to the College within 6 weeks of the commencement of the college stating fully the reasons for withdrawal together with supporting documents and endorsement from his parent/guardian.
 - ii) The College is satisfied about the genuineness of the case and that even by taking into account the expected period of withdrawal, the student has the possibility to complete the programme requirements (160 credits) within the time limits specified by the university.
 - iii) The student does not have any dues or demands at the College / University including tuition and other fees as well as library material.
 - iv) A student availing of temporary withdrawal shall be required to pay such fees and/or charges as may be fixed by the college until such time as his/her name appears on the Student's roll list. The fees/charges once paid shall not be refunded.
 - 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.

Seme	ster End Examination (SEE)	:	50% (50 marks)
	Continuous Internal Evaluation (CIE)	:	50% (50 marks)
i)	Quizzes, Tutorials, Assignments,		
	Seminars, mini projects, tutorials etc.	:	10 marks
ii)	Mid-semester Examination	:	40 marks

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

- 8.4 The letter grade awarded to a student in a 0-0-P (Practical) course, is based on an appropriate continuous evaluation scheme that the course instructor shall evolve, with the approval of the pertinent DUGC and the performance in SEE held on specified period in a semester.
- 8.5 The course Instructor shall announce in the class and/or display at the Faculty door/website the details of the Evaluation Scheme, including the distribution of the weightage for each of the components and method of conversion from the raw scores to the letter-grades within the first week of the semester in which the course is offered, so that there are no ambiguities in communicating the same to all the students concerned.

8.6 **Passing standards**

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

- 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.

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

8.7 i) Grade point scale for absolute grading

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

8.8 Earning of Credits

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

- **8.9** The Transitional Grades 'I', 'W' and 'X' would be awarded by the teachers in the following cases. These would be converted into one or the other of the letter grades (S-F) after the student completes the course requirements.
 - Grade 'I': To a student having satisfactory attendance at classes and meeting the passing standard at CIE, but remained absent from SEE for valid & convincing reasons acceptable to the College, like:
 - i) Illness or accident, which disabled him/her from attending SEE;
 - ii) A calamity in the family at the time of SEE, which required the student to be away from the College;
 - Students who remain absent for Semester End Examinations due to valid reasons and those who are absent due to health reasons are required to submit the necessary documents along with their request to the Controller

of Examinations to write Make up Examinations within 2 working days of that particular examination for which he or she is absent, failing which they will not be given permission. This is admissible only for students who have more than 45 CIE marks.

- Grade 'W': To a student having satisfactory attendance at classes, but withdrawing from that course before the prescribed date in a semester under Faculty Advice
- Grade 'X': To a student having attendance ≥85% and CIE rating (90%), in a course but SEE performance observed to be poor, which could result in a F grade in the course. (No 'F' grade awarded in this case but student's performance record maintained separately).

8.10 Grade Card

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

8.11 The Make Up Examination

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

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

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

9. **EVALUATION OF PERFORMANCE**

The overall performance of a student will be indicated by two indices: SGPA; which is the Semester Grade Point Average, and CGPA which is the Cumulative Grade Point Average.

SGPA for a semester is computed as follows.

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

SGPA = -

∑[(course credits)]

CGPA is computed as follows:

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

CGPA =-

 \sum (course credits)] (for all courses excluding those with F grades until that semester)

10. COMMUNICATION OF GRADES

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

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

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

11.2 A Student shall be declared fail if he / she

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

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

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

- (a) Students having not more than four F grades in the two semesters of first year of the Programme shall be eligible to move to second year.
- (a.1) Students having not more than four F grades in the four semesters of I and II year shall be eligible to move to III year.
- (a.2) Students who have earned all the prescribed credits of I year, and having not more than four grades in the four semesters of II and III year shall be eligible to move to IV year.
- (B) Vertical Progression in case of Diploma students admitted to Second year (lateral entry):
 - (a) Students having not more than four F grades (excluding the Fail or pass status of Additional Mathematics I and II) in the two semesters of II year of the Programme shall be eligible to move to III Year.
 - (a.1) Students having not more than four F grades (excluding the Fail or pass status of Additional Mathematics I and II, if any) in the four semesters of II and III year shall be eligible to move to IV year.
 - (b) The mandatory non-credit Courses Additional Mathematics I and II prescribed at III and IV semesters respectively, to lateral entry Diploma holders admitted to III semester of B.E/B.Tech. Programmes shall attend the classes during the respective semesters to satisfy attendance and CIE requirements and to appear for the University examinations.

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

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

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

- (C) Vertical Progression in case of B.Sc students admitted to Second year (Lateral entry):
 - (a) Students having not more than four F grades (excluding the Fail or pass status of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme) in the two semesters of II year of the Programme shall be eligible to move to III year.
 - (a.1) Students having not more than four F grades (excluding the Fail or pass status of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme, if any) in the four semesters of II and III year shall be eligible to move to IV year.
 - (b) The prescribed mandatory non-credit Courses Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme to lateral entry B. Sc holders admitted to III semester of B.E/B. Tech Programmes, shall attend the classes during the respective semesters to complete CIE and attendance requirements and to appear for the University examinations.
 - (b.1) In case, any student fails to satisfy the attendance requirement of the above said Courses; he/she shall not be eligible to appear for the Semester End Examinations of that semester and shall not be permitted to take admission to next higher semester. The candidate shall be required to repeat that semester during the subsequent year.
 - (b.2) Students who have satisfied the attendance requirement but not the CIE requirements of the above said Courses, shall be permitted to register afresh and appear for SEE after satisfying the CIE requirements in the same Course/s (with or without satisfying the attendance requirement) when offered during subsequent semester/s.
 - (c) Completion of Engineering Graphics and Elements of Civil Engineering and Mechanics shall be mandatory for the award of degree.

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

11.4 Termination from the programme

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

- i) Failure to secure a CGPA = 5.0 on three consecutive occasions.
- ii) Failure to earn a credit of 160 (120 for lateral entry students) in 8 years (6 years for lateral entry students) of duration from the

year of admission including the duration of temporary withdrawal (leave of absence).

- iii) Absence from classes for more than **six weeks at a time** in a semester without leave of absence being granted by competent authorities.
- **iv)** Failure to meet the standards of discipline as prescribed by the college from time to time.

12. AWARD OF CLASS

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

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

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

Percentage = $(GPA - 0.75) \times 10$

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 (160 credits for regular students registered for 4 year degree programmes & 120 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:

- Admitted to I semester / I year from the academic year 2018-19 (i.e. USN XXX18XXXXX)
- 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 ≥D in all courses from 5thto 8thsemester in 'first attempt' only.
- (ii) Students not having CGPA greater than or equal to 8.5 at the end of the B.E. programme shall not be eligible for the award of Honors degree, even if they have satisfied the requirement of additional credits.
- (iii) Students shall take up additional course work, other than the regular courses prescribed by the University from 5thto 8thsemester from NPTEL and other platforms notified by the University and complete the same in any number of attempts with a final score (online assignments: 25 % + Proctored examination: 75 %) leading to the following certificates ELITE (60 to 75 %) or ELITE + SILVER (76 to 89 %) or ELITE + GOLD (\geq 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, nonrefundable 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</p>
- (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 takeup/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.
- I) 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.

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

LIST OF MAJOR SCHOLARSHIPS

- 1. Scholarship details will be published in the notice board near College Academic Section. Students must see the notice board and submit the application before due dates.
- 2. All SC/ST and Category I students who have not paid any fee in CET must apply for Fee concession or Scholarship. Otherwise they must pay the tuition fee and college fee.
- 3. The students, who are applying for any of the above scholarship through online, must submit the hardcopy with supporting documents (with attestation) to the academic section in time.



CIVIL ENGINEERING

V & VI SEMESTER

With

Scheme of Teaching

& Examination

1.	Dr. I. Ramesh Mithanthaya	Ph. D	Prof./ Vice Principal
			/Dean(Aca)
2.	Dr. A.N. Parameswaran	Ph. D	Professor/ Director (III)
3.	Dr. Arun Kumar Bhat	Ph. D	Professor/HOD
4.	Dr. Udayakumar G.	Ph. D	Professor
5.	Dr. Srinath Shetty K.	Ph. D	Professor
6.	Dr. Radhakrishnan K.	Ph. D	Professor
7.	Mr. Bhandage A R	M. Tech	Associate Professor
8.	Dr. Bhojaraja B E.	Ph. D	Associate Professor
9.	Dr. Ranjith A	Ph. D	Associate Professor
10.	Dr. Shaik Kabeer Ahmed	Ph. D	Associate Professor
11.	Dr. Shriram P Marathe	Ph. D	Associate Professor
12.	Mr. J.K. Lokesh	M.Tech	Asst. Prof. Gd III
13.	Dr. Pushparaj A Naik	Ph. D	Asst. Prof. Gd III
14.	Dr. Mithun B.M.	Ph. D	Asst. Prof. Gd III
15.	Dr. Saranya P	Ph. D	Asst. Prof. Gd III
16.	Dr. Shanmukha Shetty	Ph. D	Asst. Prof. Gd III
17.	Mr. Sundip Shenoy R.	M.Tech. (Ph. D)	Asst. Prof. Gd II
18.	Mr. Gururaj Acharya	M.Tech.	Asst. Prof. Gd II
19.	Mr. Rakshith Kumar Shetty	M.Tech.	Asst. Prof. Gd II
20.	Mr. Manjunath M.	M.Tech. (Ph. D)	Asst. Prof. Gd II
21.	Mr. Roshan Rai	M.Tech.	Asst. Prof. Gd II
22.	Mr. Arjun K Punja	M.Tech	Asst. Prof. Gd II
23.	Mr. Thushar S. Shetty	M.Tech. (Ph. D)	Asst. Prof. Gd II
24.	Mr. Prashantha Kumar K.	M.Tech (Ph. D)	Asst. Prof. Gd I
25.	Mr. Prithviraj H.K.	M.Tech. (Ph. D)	Asst. Prof. Gd I
26.	Mr. Pradeep Karanth	M.Tech. (Ph. D)	Asst. Prof. Gd I
27.	Ms. Thanushree Hegde	M.Tech. (Ph. D)	Asst. Prof. Gd I
28.	Ms. Deekshitha M	M.Tech. (Ph. D)	Asst. Prof. Gd I
29.	Mr. Ekanath P.	M. Tech.	Visiting Faculty
30.	Mr. Rajesh D. Maistry	M. Tech.	Visiting Faculty

DEPARTMENT: CIVIL ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

Vision

To uphold the Department as a leader in community development through innovation and excellence in diverse areas of Civil Engineering to meet the global challenges and market demands.

Mission

- To provide the students a strong theoretical knowledge and practical skills to understand the basic concept and fundamentals of various Civil Engineering subjects.
- 2. To be competent and skilled enough to take the challenges in Research, Consultancy and Entrepreneurship.
- 3. To encourage the students in developing professional ethics through discipline and principles.

Programme Educational Objectives (PEOs)

The graduates of the program will be

- PEO1 Equipped with fundamentals of civil engineering along with interdisciplinary science, engineering and management concepts.
- PEO2 Equipped with advanced and emerging field of civil engineering practices to compete and match with the industrial requirements.
- PEO3 Competent enough to conceive the ideas, prepare plan, design, execute, monitor and manage the project with the effective utilization of resources such as men, material, machine and money along with time effectively.
- PEO4 Continue to learn and adapt to suit the needs and challenges of real world problems and come up with optimal solutions.

Programme Outcomes (POs)

Engineering knowledge: Apply the knowledge of mathematics,
 PO1 science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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

Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that

PO3 meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4
 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction

- and modeling to complex engineering activities with an understanding of the limitations.
- PO6 **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.

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.

- PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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.

PO11 **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.

PO12 **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)

PSO1 Ability to apply the knowledge of Civil Engineering domains, conduct experiments, analyze, interpret data and design the system components.

PSO2 Enrich the knowledge in Structural, Geo technical, Transportation, Environmental Engineering, Water Resources, Infrastructure and Development, Surveying and Geo-informatics by means of innovative practices.

PSO3 Competency to plan, produce detailed drawings, write specification, prepare cost estimates, selection of materials, schedule work plans, execute and value real properties.

Syllabus of V & VI Semester B.E. / Civil Engg.

V SEMESTER

					Teach	ning	Hours	Week		Exan	ninatio	n	
SN	Course Category	Course Code	Course Title	Teaching Department	Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration	CIE Marks	SEE Marks	otal Marks	Credits
					L	т	Р	S			•,	F	
1	PCC	21CV501	Structural Analysis - II	CV	3	-	-	-	3	50	50	100	3
2	IPCC	21CV502	Transportation Engineering	CV	3	-	2	-	3	50	50	100	4
3	PCC	21CV503	Design of RC Structural Elements	CV	3	-	-	-	3	50	50	100	3
4	PCC	21CV504	Geotechnical Engineering	CV	3	-	-	-	3	50	50	100	3
5	PCC	21CV505	Geotechnical Engineering Lab.	CV	-	-	2	-	3	50	50	100	1
6	AEC	21HU511	Research Methodology & Intellectual Property Rights	CV/ME	2	-	-	-	3	50	50	100	2
7	HSMC	21CV512	Environmental Studies	CV	1	-	-	-	1	50	50	100	1
8	AEC	21CVA5X	Ability Enhancement Course - V	CV	1	-	-	-	1	50	50	100	1
			TOTAL	•	16	-	4	-	-	400	400	800	18

VI SEMESTER

					Teac	hing	Hours /	Week		Exar	ninatio	on	
SN	Course Category	Course Code	Course Title	Teaching Department	Lecture	H Tutorial	Drawing	Self-Study Component	Duration	CIE Marks	SEE Marks	Total Marks	Credits
1	PCC	210/601	Design of Steel Structural Elements	CV	3		-		3	50	50	100	3
-	FCC	2100001		CV	3	-	-	-	5	50	50	100	5
2	HSMC	21CV602	Engineering Project Management	CV	3	-	-	-	3	50	50	100	3
3	IPCC	21CV603	Concrete Technology	CV	3	-	2	-	3	50	50	100	4
4	PEC	21CVE1XX	Professional Elective Course - 1 (Group 1)	CV	3	-	-	-	3	50	50	100	3
5	OEC	21CV8XYY	Open Elective Course - 1	CV	3	-	-	-	3	50	50	100	3
6	PCC	21CV604	Computer Aided Detailing of Structure	CV	-	-	2	-	3	50	50	100	1
7	PROJ	21CV605	Mini Project	CV	-	-	2	-	-	100	-	100	2
8	INT	21INT61	Innovation/Entrepreneurship/Social based	CV	-	_	-	_	_	100	_	100	3
			Internship (4 Weeks)										
			TOTAL		15	-	6	-	-	500	300	800	22

STRUCTURAL ANALYSIS-II

Course Code:	210/501		PCC
Course Code: Teaching Hours (Week (I : T: P: S)	2100501	Course Type	02
Total Teaching Hours	2:2:0:0	Cleans CIE + SEE Marks	03 50±50
	a Donartmont: Civ	il Enginooring	50+50
Course Learning Objectives:	g Department. Civ	il Engineering	
1. Explain strain energy concept an	d analyze statically	indeterminate trusses usir	ng minimum strain
energy method.	, ,		5
2. Develop slope deflection equation:	s and analyze indet	erminate beams and frames.	
3. Analyze indeterminate beams and	frames using mome	ent distribution method.	
4. Demonstrate Kani's Rotation Contr	ibution method to	analyze indeterminate beam	s and frames.
5. Analyze indeterminate beams using	g matrix method.		
	LINIT – I		
Indeterminate (Redundant) Trusses	0111 - 1		08 Hours
Introduction, analysis of statically indetern	ninate trusses using	g minimum strain energy me	ethod (redundant up
to second degree).)	····
Slope Deflection Method			08 Hours
Introduction, sign convention, developme	nt of slope-deflecti	on equations, analysis of co	ntinuous beams and
symmetrical frames (indeterminacy up to t	wo)		
	UNIT – II		
Moment Distribution Method			08 Hours
Introduction, distribution factor, develop	ment of distribution	on table in analysis of cor	tinuous beams and
symmetrical frames (indeterminacy up to t	wo)	·	
Kani's Rotation Contribution Method			08 Hours
Introduction, rotation factor, analysis of co	ntinuous beams an	d symmetrical frames.	
	UNIT – III		
Fundamentals of Matrix Method			08 Hours
Introduction, axes and coordinates, flexibi	lity and stiffness ma	atrix method, relationship be	tween flexibility and
stiffness matrices, system approach of flex	ibility and stiffness	matrix method for analysis c	of propped cantilever
and continuous beams (up to two span).			

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

- **1.** Analyze the indeterminate trusses using minimum strain energy method.
- **2.** Develop slope deflection equations and analyze continuous beams and symmetrical frames.
- 3. Analyze the indeterminate beams and symmetrical frames using moment distribution method.
- **4.** Carryout analysis of continuous beams and symmetrical frames by Kani's rotation contribution method.
- **5.** Explain the concept of flexibility and stiffness, develop relationship between flexibility and stiffness matrices and analyze the indeterminate beams by matrix method.

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
21CV501.1	2	3	-	-	-	-	-	I	-	-	-	-	2	3	-
21CV501.2	2	3	1	-	-	-	-	I	-	-	-	-	2	3	-
21CV501.3	2	3	-	-	-	-	-	-	-	-	-	-	2	3	-
21CV501.4	2	3	-	-	-	-	-	-	-	-	-	-	2	3	-
21CV501.5	2	3	1	-	-	-	-	-	-	-	-	-	2	3	-
1: Low 2: Medium 3: Hig	jh 🗌														

TEXTBOOKS:

1.	Punmia B. C., Ashok Kumar Jain, Arun Kumar Jain, "Strength of Materials and Theory of Structures",
	Volume I & Volume II, Laxmi Publications (P) Ltd., 2019.
2.	Ramamrutham S., "Theory of Structures", Dhanpat Rai & Sons, New Delhi, 2018.

3. Shah H. J. and Junnarkar S. B., "Mechanics of Structures", Volume I & II, Charotar Publications, New Delhi, 2016.

REFERENCE BOOKS:

1.	Reddy S. C., "Basic Structural Analysis", Tata McGraw Hill Education, New Delhi, 2017.
2.	Vaidyanathan R. and Perumal P., "Structural Analysis", Volume I & II, Laxmi Publications (P) Ltd., 2017.
3.	Vazirani V. N. and M. M. Ratwani, "Analysis of Structures", Khanna Publications, New Delhi, 2015.
4.	Pandith G. S., Gupta S. P., "Structural Analysis – A Matrix Approach", Tata McGraw Hill, New Delhi, 2015.
5.	Prakash Rao D. S., "Structural Analysis-A unified Approach", University Press, 2012.
6.	Wang C. K., "Indeterminate Structural Analysis", Tata McGraw Hill Publications, 2010.

E Books / MOOCs/ NPTEL

- 1. <u>https://nptel.ac.in/courses/105/101/105101086/</u>
- 2. <u>https://nptel.ac.in/courses/105/105/105105109/</u>

04 Hours

04 Hours

TRANSPORTATION ENGINEERING

Course Code:	21CV502	Course Type:	IPCC
Teaching Hours/Week (L:T:P: S):	3:0:2:0	Credits:	04
Total Teaching Hours:	40+0+26	CIE + SEE Marks:	50+50

Teaching Department: Civil Engineering

Course Learning Objectives:

1.	To understand the recent development in highways, and understanding the
	planning and alignment of a highway network.
2.	To acquire the knowledge of design principles and standards for highway
	geometrics.
3.	To comprehend the properties and requirements of basic pavement

- materials and to understand the basic principles of pavement design.
- 4. To acquire the fundamental knowledge on railway engineering and tunneling.
- 5. To gain the basic knowledge of airport engineering and harbors.

UNIT – I

Transportation

Importance, modes– comparison, road transport-characteristics, Jayakar committee recommendations and implementation, 3rd road development plan and Problems, NHDP, PMGSY, RDP-vision 2021, RRDP-vision 2025.

Highway Planning and alignment02 HoursPlanning surveys – master plan and saturation system, road alignment: ideal alignment, factorsGeometric design10 Hours

Importance, factors affecting, cross sectional elements, design speed, sight distances- stopping and overtaking, design of horizontal alignment- speed, radius, super elevation, extra widening at curves, transition curves, design of vertical alignment- gradient, grade compensation, summit curve and valley curves.

UNIT – IIPavement materials and design06 HoursDesirable properties of road aggregates, bituminous binders (Bitumen, Tar, Emulsion, Cutback)
and subgrade soil, CBR and Plate load tests on soil. Pavement Types, Design of flexible
pavement by IRC 37-2001 method (design steps and problems only).05 HoursElements of Railway Engineering05 HoursPermanent way and its requirements, gauges. Functions and requirements of following
elements of permanent way: Rails, Sleepers, Ballast, Track fitting and fasteners. Calculation of
quantity of materials required for laying a railway track.

TUNNELS

Introduction-Advantages and limitations, Size and shape of tunnels, Tunnel lining, Tunnel ventilation and drainage.

	UNIT – III	
Elemen	ts of Airport Engineering	05 Hours
Typical	Layouts, site selection, airport classification, regional Planning. Geo	ometric design
element	s of runway, basic runway length – Corrections.	04 Цанта
		04 Hours
Classific	ations, site selection, typical layout, function of various elements of harbo	Dr.
	Suggested List of Experiments	
	Crushing test on aggregates	
2.	Impact test on aggregates	
3.	Abrasion test on aggregates	
4.	Shape test on aggregates	
5.	Specific gravity of aggregates and bitumen	
6.	Softening point test on bitumen	
7.	Ductility test on bitumen	
8.	Flash and fire point test on bitumen	
9.	Penetration test on bitumen	
10.	Viscosity test on bitumen	
11.	CBR test on subgrade soil	
Course	Outcomes: At the end of the course student will be able to	
1.	Ilustrate the road development in India and describe planni	ng stages in
ľ	nghway network.	
2. I	fake use of the design standards for highway geometrics juidelines.	as per IRC
3. E	Explain the requirements of basic construction materials and lexible pavement structure as per IRC.	design the

- 4. **Demonstrate** the various elements of the tunneling and permanent way and to **calculate** the required quantities of materials for railways.
- 5. **Explain** the components of airport and to **compute** the corrected length of a runway. Also, to **narrate** the functions of components in harbor

Course	Course Outcomes Mapping with Program Outcomes & PSO															
Р	rogram Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12		PSO \	\downarrow
↓ Co	urse Outcomes													1	2	3
	21CV502.1	3	1	1										2	2	1
	21CV502.2	2	3	2										2	2	2
	21CV502.3	3	1	2										1	3	2
	21CV502.4	3	2	1										2	2	1
	21CV502.5	3	1	1										1	2	1
	1: Low 2: Medium 3: High															
TEVTO																
1.	 Khanna. S. K, Justo. C.E.G, Veeraragavan. A, "Highway Engineering", Revised 10th edition, Nem Chand and Bros, 2014. 															
2.	Saxena. S.S., Arora S.P., "A Text Book of Railway Engineering", DhanpathRai and Sons, New Delhi, 2 nd Revised edition 2013.															
3.	Khanna S.K., Arora M.G., Jain S.S., "Airport Planning and design", Nem Chand and Bros, Roorkee, 6 th Revised edition, 2009.															
4	 R. Srinivasan, "Harbour, Dock and Tunnel Engineering", Charotar Publishing House Pvt. Ltd., Anand (Gujarat), 27th Revised edition, 2015. 															
REFERE	NCE BOOKS:															
1.	Sharma S K," Principle Company Ltd., New D	es, P Delhi	ract i, 3 rd	ice a Rev	and /isec	Des I Ed	ign itior	of H n. (20	lighv 015)	way	Engi	neerii	ng", S	S Cha	and	and
2.	Kadiyali L. R., Lal. N.B. Publishers, New Delh	, "Pr i. 7 ^{tł}	incij ' Rev	oles viseo	and d Ed	Pra itior	ctic n. (2	es ir 013)	n Hig).	ghw	ay Er	igine	ering	", Kh	anna	1
3.	Relevant IRC codes p	ubli	shec	l by	Bur	eau	of I	ndia	n St	and	ards,	New	Delh	i.		
4.	Handbook for Roads	and	brio	dges	5 – N	/OR	τH,	Nev	v De	elhi	(2009)).				
5	Rangwala, "Airport Er 16 th Revised edition, 2	ngin 2016	eerii 6.	ng″	Cha	rota	r Pu	blisl	hing	Но	use F	vt. Lt	d., Aı	nand	l (Gu	jarat),
6	Satish Chandra., Agai Delhi, 2 nd Revised edi	rwal tion	. M.I 201	M., " L3.	'Rail	way	Eng	jine	ering	g", C	Dxfor	d Uni	versi	ty Pr	ess, l	New
7	Delhi, 2 nd Revised edition 2013. C Venkatramaiah, "Transportation Engineering", Volume II: Railways, Airports, Docks and Harbours, Bridges and Tunnels, Oxford University Press, New Delhi, 1 st edition 2016.															

E Books / MOOCs/ NPTEL							
1.	https://nptel.ac.in/courses/105/105/105105107/						
2.	NPTEL Source for Transportation Engineering II <u>http://nptel.ac.in/courses/105107123/</u>						
3.	Railway Engineering eBook:						
	http://dl4a.org/uploads/pdf/Ebook%20-%20Railway%20Engineering%20.pdf						

	DESIGN OF R.C.C. STRUCTURAL ELEMENTS							
	Cou	rse Code:	Code: 21CV503 Cours					
	Теас	hing Hours/Week (L: T: P: S):	3:0:0:0	Credi	its:	03		
	Tota	l Teaching Hours:	40+0+0	CIE + SEE Mar	ks:	50+50		
	Teaching Department: Civil Engineering							
(Cours	e Learning Objectives:						
	1.	To summarize the basic knowledge of construction materials, codal requirements, limit state method and working stress method.						
	2.	To analyze the singly reinforced section and doubly reinforced section subjected to flexure and shear.						
	3.	To know the design and detailing IS 456: 2000.	concepts of R	C beams by limit state	meth	od as per		
	4.	To know the design and detailing concepts of RC columns by limit state method as per IS 456: 2000.						
	5.	To know the design and detailing of RC one way slabs and two way slabs for different boundary conditions as per IS 456: 2000.						
					1л ци	ours		
]	Introduction to RCC							

Materials, advantage and general features of Reinforced Concrete (RC), design requirements of IS 456:2000, design philosophy – Working stress and Limit State Methods.

Principles of Limit State Method of design and Ultimate Strength of RC sections

Introduction, characteristic and design loads, principles of LSM of design, characteristic and design strength, general aspects of ultimate strength, stress block parameters for limit state of collapse, analysis of RC sections – ultimate flexural strength of singly reinforced and doubly reinforced sections, ultimate shear strength of RC sections, Concepts of development length and anchorage

UNIT – II															
														15	Hours
Serviceability Limit States															
General aspects, deflection la	imit	s as	s ре	r IS	5 45	6:20	100,	cale	cula	tion	of d	leflect	tion	(the	oretical
method), cracking in structura	СО	ncre	ete n	nem	ber.	s, cra	ack	widt	h co	շեր	ıtatic	on.			
Design of Beams															
Practical requirements, critical	see	ctior	n de	sigr	n pr	oce	dure	s fo	or m	ome	nts a	ind s	hear	s, ch	eck for
anchorages and development	ler	ngth	ı, de	esigi	n of	rec	tang	gula	r se	ectior	ns (si	mply	sup	porte	ed and
cantilever beams).															
Design of Columns – Gener	al a	aspe	ects,	effe	ectiv	ie le	engt	h, le	oad.	s, sle	ender	ness	ratio	o, mi	nimum
eccentricity, design of short a.	kiall	y lo	adeo	d co	lum	ns, i	desi	gn c	of co	olumi	ns su	bject	ed to	o cor	nbined
axial load, uniaxial and biaxial	ben	ding	g usi	ng l	[S 4!	56:2	000	and	SP	16.					
				116	117	TTT									
					111 -	- 111								10	Hours
Design of Slabs														10	nours
Practical requirements design	of	sim	nlv	sun	nor	tod	one	wa	va	nd tw		av da	ahci	for s	alactad
boundary conditions and <i>desi</i>	$\frac{1}{2}$	of ca	ipiy antili	sup sver	· slai	lcu hc a	s ne	r ISz	y ai 156:		VO VV	ay 310	105	101 3	
boundary conditions and desig	jirt				Sia	<i>55 a</i> .	s pc	15-	190.	2000.	•				
Course Outcomes: At the end	of	the	COLI	·ςρ (tud	ent	will	he a	hle	to					
1. Explain the working stre		and	limi	t cta	nto r	noth	nde		ner	IS 45	6.200	0			
2. Estimate the moment	, <u>, , , , , , , , , , , , , , , , , , </u>	rrvir		- 310 - 202		an	n ch	l us j noar	roc	istan		of sin	alv	roinf	orced
section and doubly rein	ford	പ്പ	ig c cart	apa ion	ucin	a lir	nit c	tate	me	athod		/ 3///	giy	Tenn	orceu
3. Analyze design and ske	atch	the	ctri	ictu	ral c	l <u>o</u> ta	ilina			angul	Iar R(^ hea	mc		
4. Analyze design and ske	atch	the	ctri	ictu	ral c	lota	ling	of		olum			1113.		
5. Analyze, design and ski	atch	the	str	ucti	iral	deta	iling		one			. wav	and	cant	ilovor
RC slabs			5.50	acte	nui		iiiii i	<i>y</i> 01	one	, way	,	, way	unu	cum	never
Course Outcomes Manning	vitk	Dr	ara		Jut	com	<u>م</u> ۶	δ DQ	50						
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	-	-	5			Ŭ	,	0	5	10			1	2	2
	1							1				1	1	2	5
21CV503.1 21CV503.2	2	2						1				1	2	2	
2107503.2	2	1	3					1				1	2	3	2
210/503.5	2	1	3					1				1	2	3	2
210/503.4	2	1	3					1				1	2	3	2
1: Low 2: Medium	2• F	- liah						-				-	-	5	-
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TEXTBOOKS															
1. N Krishnaraju and R		Pran	esh	Rei	nfor	red	Cor	ocret	he D	esiar) (ISA	56.20	000-	Princ	inles
and Practice New A	ne I	nter	nati	ona	l Pu	blisł	ners	Ne	w D	elhi	2006	50.20			
2. Dr. B.C. Punmia Ashe	ok K	uma	ar la	in a	nd 4	Arun	Kur	nar	Jain	Lim	it Sta	Ite De	sian	n of	
Reinforced Concrete	La	xmi	Puh	licat	tion	s (P)	Lim	nited	I. Ne	ew De	elhi. 1	2007	Joigh		
	, _0.				-	· · · · · · · · · · · · · · · · · · ·									

REFERENCE BOOKS:						
1.	Dr. Ramchandra and Virendra Gehlot, Limit State Design of Concrete Structures (As					
	per IS: 456-2000), Scientific Publishers (India), Jodhpur, 2010.					
2.	S. N. Sinha, Reinforced Concrete Design, Tata- McGraw Hill Publishing Company					
	Limited, New Delhi, 2014.					
3.	Dr. P.C. Varghese, Limit State Design of Reinforced concrete, 2 nd Edition, Prentice Hall					
	of India Private Limited, 2004.					
4.	IS: 456-2000 (to be supplied in the examination), SP16.					
E Books / MOOCs/ NPTEL						
1.	https://nptel.ac.in/courses/101/104/105105105/					
2.						

GEOTECHNICAL ENGINEERING						
Cou	rse Code:	21CV504	Course Type:	PCC		
Теас	ching Hours/Week (L: T: P: S):	3:0:2:0	Credits:	03		
Tota	al Teaching Hours:	40+0+0	CIE + SEE Marks:	50+50		
	Teaching Dep	partment: Civil	Engineering			
Cour	se Learning Objectives:		0 0			
1.	To acquire knowledge of Soil as a	a three phase s	ystem and explain index pr	operties.		
2.	To understand the need for soil c	lassification ba	sed on IS classification syst	ems and to		
	know the concept of Soil Structur	re also to Desci	ribe the various types and r	nethods		
	involved in the study of stresses u	under various t	ypes of loadings.			
3.	To understand the concept of Per	rmeability and	Capillarity on soils and stud	ly the		
	effect of Compaction Characteristics on soil.					
4.	To understand the Consolidation	characteristic o	of soil and its use in the fiel	d of		
	foundation engineering.					
5.	To understand the Shear Strength	n of soil and its	determination-using labor	atory		
	experiments, and Assess the bear	ring capacity of	f various types of shallow fo	oundations		
	and estimate the probable settler	ments.				
		UNII-I				
INDE	X PROPERTIES OF SOILS AND	THEIR DETER	RMINATION:	7 Hours		
Phase	e Diagram, Definitions- void ratio, p	oorosity, degree	e of saturation, percentage	air voids, air		
conte	nt, specific gravity, water content,	soil densities, f	unctional relationships, fiel	d		
ident	ification of soils.					
Index Properties: Grain size distribution, Atterberg's Limits and Indices, Insitu density, density						
index Laboratory determination: specific gravity, grain size distribution-sieve analysis and						
sedimentation analysis (Hydrometer Method), Liquid Limit (Casagrande Method), plastic limit						

and shrinkage limit.

SOIL CLASSIFICATION and STRUCTURE

04 Hours

05 Hours

Classification of soils: Need for classification, Plasticity Chart and its importance, IS Soil Classification System.

Soil structure Soil structure –Single grained, honey combed, flocculent and dispersed structures.

STRESS DISTRIBUTION IN SOILS:	05 Hours

Boussinesq's theory – point load, line load, strip load, uniformly loaded circular area, Vertical stress distribution diagrams, Newmark's influence chart, Westergard's equation, Comparison.

LINITT TT

SOIL HYDRAULICS:	05 Hours			
Darcy's law - assumptions and validity; coefficient of permeability, See	epage velocity, superficial			
velocity and coefficient of percolation. Laboratory determination (constant head and variable				
head tests), field determination (pumping out test). Factors affecting permeability.				
SOIL COMPACTION:	04 Hours			
SOIL COMPACTION: Moisture-density relationship, Zero-air voids line	, laboratory tests (light			

and heavy compaction), factors affecting compaction. Field compaction methods, compaction specifications and field control.

COMPRESSIBILITY OF SOIL AND CONSOLIDATION:

Compressibility of soil and consolidation: Compressibility of soil and volume changecompression index, coefficient of compressibility, coefficient of volume change. The consolidation process- spring analogy, normally consolidated and over consolidated soils, pre-consolidation pressure and its determination (Casagrande method). Terzaghi's theory of one-dimensional consolidation – assumptions, coefficient of consolidation and its determination by square root of time and logarithm of time fitting methods, computation of consolidation settlement.

consolidation settlement.					
UNIT - III					
SHEAR STRENGTH OF SOILS: 05 Hours					
Shear strength of soils: Stress – strain curve, Mohr - Coulomb failure residual strength theory. Total and effective shear strength parameter measurement of shear strength parameters by direct shear test, tri-ax (different drainage condition), unconfined compression test and vane affecting shear strength of soils, sensitivity and thixotropy.	criterion, peak and rs, laboratory kial compression test e shear test. Factors				
BEARING CAPACITY AND SETTLEMENT OF SHALLOW FOUNDATIONS	05 Hours				

Bearing capacity of shallow foundations: Basic definitions, types of shear failure in foundation soil, Terzaghi's and IS code methods, effect of ground water table and eccentricity. SETTLEMENT: Types and modes of settlement -Allowable limits of settlement (IS 1904- 1986) allowable bearing pressure.

С	Course Outcomes: At the end of the course student will be able to																	
1	L.	Assess the index properties of soil and to analyze the index properties of soil using																
		laboratory tests .																
2	2.	Expla	ain the need for cla	ssifi	cati	on, (class	sify	the	soil	bas	ed c	n IS	SCS,	illust	rate [·]	the s	oil
		struc	ture, and Describe	the	vari	ious	typ	es a	nd	net	hod	s inv	volve	d in	the s	tudy	of	
		stres	ses under various t	type	s of	load	ding	S.										
3	3 .	Asse	ss the permeability	/ and	d co	mpa	actic	on cl	hara	cter	ristic	s of	soils	5.				
2	I.	Mak	e use of principle o	of co	nso	lidat	tion	and	l to	estir	mate	e th	e coe	efficie	ent o	f		
		cons	olidation using od	ome	eter	test.												
5	5.	Evalu	late the shear strer	ngth	par	ame	eters	s of	soil	and	l me	asu	re its	shea	ar str	engt	h,	
		Dete	rmine the bearing	cap	acity	/ of	shal	low	fou	nda	tion	s ap	plyir	ng Te	rzag	hi's, I	S co	de
		meth	nods and estimate	the	sett	leme	ent o	of fo	ound	datio	on.							
С	ours	e Out	tcomes Mapping	with	n Pro	ogra	am (Out	com	ies a	& P:	SO						
-		Pro	gram Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12		PSO	Ļ
-	↓ C	Course	Outcomes	-												1	2	3
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		2	1CV504.2	1	3	1	-	-	-	-	-	-	-	-	-	1	3	-
-		2	1CV504.3	2	3	1	-	-	-	-	-	-	-	-	-	2	2	-
-		2	1CV504.4	2	3	2	-	-	-	-	-	-	-	-	-	2	2	-
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		⊥.	Pullinia B.C. (2017	') S		vieci	IIdIII	CS d	mu	oui	lua	lion	S Ld.		ublis	sning	ј С0.	
		2.	Gopal Ranjan and	Ra	о А.9	S.R.,	"Ва	sic a	and	Арр	lied	Soi	l Me	chan	ics", l	New	Age	
			International Pvt	Ltd,	Pub	lishe	ers (201	6)									
R	EFE	RENC	E BOOKS:															
1.			Purushothama Ra	ij. P.,	(20	05) '	"Geo	otec	hnio	al E	ngi	neer	ing",	Tata	McG	Graw	Hill	
			Publishing Compa	any	Ltd,	Nev	v De	elhi.										
2.			Murthy V.N.S., (20)18)	"Pri	ncip	les	of S	oil N	/lecł	nani	cs a	nd F	ounc	latior	n Eng	ginee	ering",
			UBS Publishers Di	istril	outo	rs P	vt. L	td.										
3.			B. M. Das, and Na	agaı	atna	am (201	9)″F	rinc	iple	s of	Fou	Indat	ion I	Engin	eerii	ng, N	linth
			Edition, SI Edition	•														
4.			Venkatramaiah C	(200)6) "	Geo	tecł	nnic	al E	ngin	eeri	ng",	Uni	/ersit	ties P	ress	(Indi	a) Ltd.

5	Terzaghi K. and Peck R.B., (1996) "Soil Mechanics in Engineering Practice" John
	Wiley & Sons, Inc.
6	Muni Budhu, Soil Mechanics and Foundations, Third Edition, John Wiley
	And Sons, Inc, 2010.
7.	Indian Standard code of practice for design and construction of foundations in
	soils: general requirements, is: 1904–1986.
E Books / I	MOOCs/ NPTEL
1.	https://nptel.ac.in/courses/105/105/105105176/
	https://nptel.ac.in/courses/105/101/105101083/
	https://nptel.ac.in/courses/105/107/105107120/
2.	https://nptel.ac.in/courses/105/101/105101201/
	https://nptel.ac.in/courses/105/105/105105185/

GEOTECHNICAL ENGINEERING LABORATORY

Course Code:	21CV505	Course Type:	PCC Lab
Teaching Hours/Week (L: T: P: S):	0:0:2:0	Credits:	01
Total Teaching Hours:	26	CIE + SEE Marks:	50+50

Teaching Department: Civil Engineering

Course	Learning Objectives:								
1.	To provide a basic understanding of the physical and mechanical characteristics of soils								
	and how these relate to the engineering behavior of soil								
2.	o estimate index properties of soils (coarse and fine).								
3.	To estimate consistency limit of fine grained soils.								
4.	To estimate the engineering properties of the soils by density test, CBR test								
	permeability test and consolidation test.								
5	To estimate shear strength of soils by direct shear test, triaxial shear test, vane shear								
	test & unconfined compressive test								
	List of Experiments								
1.	Specific gravity of coarse and fine grained soils, moisture content (oven drying and								
	pycnometer).								
2.	Grain size analysis (sieve analysis) and classification.								
3.	In situ density by core cutter and sand replacement methods.								
4.	Atterberg's limits and indices.								
5.	Standard Proctor Compaction Test (IS light compaction test).								
6.	Coefficient of permeability (constant head and variable head methods).								
7.	Consolidation Test.								
8.	Direct shear test								

9.	Tri-axial Compression	Test	Tri-axial Compression Test (undrained)													
10.	Unconfined compressi	on st	ren	gth 1	test	-										
11.	Laboratory Vane shea	r test	t													
12.	California Bearing Ration	o tes	t.													
13.	Demonstration tests:															
	Miscellaneous equi	pmen	ıt's	suc	h a	as /	Auge	ers,	Sa	mple	ers,	Rapi	d Mo	oistu	re m	neter,
	Proctor's needle.															
	Hydrometer Test.															
	Free Swell Index and Swell Pressure Test															
Course Or	tcomes . At the end of the co	irce et	uden	t will	he	ahle	to									
	anduct the experiment	$n \approx sc$		de	ter	mir	ne t	heir	ind	ex a	and e	nain	eerin	na nr	oner	ies
ill	ustrate their significance	e.	01157	, uc	.c.	•••••		i cii	ma			ingin		ig pi	open	.105,
2. P	erform shear tests a	nd C	Calif	ornia	a b	ear	ing	rati	o te	est,	Eva	luat	e sh	ear	strer	ngth
pa	arameters and CBR valu	es, s	tate	its i	imp	orta	ance			-						-
Course Or	tcomes Mapping with Prog	ram C	Duted	mes	& P	SO										
	Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12		PSO.	
↓ Course	e Outcomes													1	2	3
	21CV505.1	1	2	1	2	1				1				1	2	1
	21CV505.2	1	2	1	2	1				1				1	2	1
	1: Low 2: Medium 3: High															
REFEREN	NCE BOOKS:	· .				"							<u> </u>			
1.	Lambe I. W., "Soil lest	ing t	or E	ngin	leer	·S″,	wile	y Ea	ister	n Lt	a., N	ew L	Jeini.		\A/la	:++
2.	Redu K.H., (2006), M	anua	101	5011	La	DOLG	atory	/ res	sung	, v	01. 1,	11, .	s ^{ra} ec	lition	, vvn	itties
3	Bowles 1 E (1988) "E	naina	on.	na D	ron	ortia		FSO	il an	и ті	noir N	1020	urom	onte	″ Mc	Graw
5.	Hill Book Co New York	rigine	een n	IG F	ιορ	ertie	25 0	50	ii aii	un		ieas	urem	ients	, не	Glaw
4.	SP: 36 (Part 1)-1987.	 Comi	pend	dium	۱ of	Ind	ian	stan	dar	ds o	n soi	l ena	ineer	rina.		
5.	Lambe T. W., "Soil Test	ing f	or E	ngin	eer	۰s″, '	Wile	y Ea	ster	n Lt	:d., N	ew D	Delhi.			
		-														
E Resourc	es		11.0 -													
1.	https://nptel.ac.in/courses/10	05/101	/105	10116	50/											
2.																
э.																

RESEARCH METHODOLOGY AND IPR

Course Code	21HU511	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	(2:0:0:0)	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	2	Exam Hours	3

Course Learning Objectives:

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

UNIT – I

Research Methodology:

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

Defining the Research Problem:

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

Reviewing the literature:

Place of the literature review in research, Bringing clarity and focus to your research problem, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed. **9 Hours**

UNIT - II

Research Design:

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

Design of Sample Surveys:

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

Data Collection:

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

Interpretation and Report Writing:

Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Interpretation and Report Writing (continued):										
Types of Rer	Martine Rechanics of Writing a Research Report Precautions for Writing Research Reports									
Types of Rep	0 Hours									
	7 Hours									
Pedagogy	Chalk and talk, Power point presentation, Videos									
UNIT – II										
Introductio	on to Intellectual Property									
Intellectual H	Property (IP) – Importance, Jurisprudential definition and concept of property, rights, duties and									
their correla	tion: evolution of IPR – Patents Trademarks Convribt & Related Rights Industrial Design									
Traditional K	non, evolution of file Futures, filademarks, copyright & Related Rights, filademarks besign,									
Agroomonto	and Theorem									
TDIDS A ana	and filedees									
1070 % man	them, Mauriu Agreement, Hague Agreement, WIFO Treaties, Budapest Treaty, Indian Falent Act									
1970 & recer	it amendments – Patent (Amendment) Rules, 2017.									
Basics of Pa	tents and Concept of Prior Art									
Introduction Invention in	to Patents; Types of patent applications, Specifications: Provisional and complete; Forms and fees the context of "prior art". Patent databases									
Patent filing	procedures									
National &	PCT filing procedure: Status of the patent applications filed: Structure of Patent document.									
Precautions y	while patenting – disclosure/non-disclosure: Patent licensing and agreement: Patent infringement-									
meaning sco	me litigation									
meaning, see	7 Hours									
	/ 110013									
Pedagogy	Chalk and talk, Power point presentation, Videos									
Course outcor	ne (Course Skill Set)									
At the end of	the course, student will be able to:									
CO1: Explai	n the significance of carrying out research work and identifying a research problem and perform e									

- literature review. **CO2:** Explain the Research Design, methodological way of execution, Data Collection, and Interpretation and Report Writing.
- **CO3:** Explain the importance of Intellectual property rights and patents.

Ass	essment	Weightage in
		marks
MS	E -I	20 marks
MS	E -II	20 marks
Tasl	ĸ−I	5 marks*
Tasl	ĸ−II	5 marks
	TOTAL	50marks
Students shall be made to revie	ew literatur	re and prepare aa rep

ne	for Semes	ter End Examination	
	UNIT	8 questions to be set of 20 marks each	Instructions
	Ι	Q.NO.1, Q.NO. 2, Q.NO.3	Solve any two out of 3
	II	Q.NO.4, Q.NO. 5, Q.NO. 6	Solve any two out of 3
	III	Q.NO.7, Q.NO. 8	Solve any one out of 2

Scheme for Semester End Examination

TEXTBOOKS

1 Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg, New Age International

4th Edition, 2018

2 Research Methodology a step-by step guide for beginners. (For the topic Reviewing the literature under module 2), Ranjit Kumar, SAGE Publications Ltd . 3rd Edition, 2011 3 Study Material (For the topic Intellectual Property under module 5) Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013

REFERENCE BOOKS

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

Web links and Video Lectures (e-Resources):

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

ENVIRONMENTAL STUDIES

Course Code:	21CV512	Course Type	MNC
Teaching Hours/Week (L: T: P: S)	1:0:0:0	Credits	00
Total Teaching Hours	15	CIE + SEE Marks	50+00

Teaching Department: Civil Engineering

Course Learning Objectives:

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

UNIT - I

03 Hours

Environment

Definition, significance of environmental studies- current scenario, local, regional, national and global problems

Components of environment: atmosphere, hydrosphere, lithosphere and biosphere.

Layers of atmosphere and its role.

Parts of Earth-lithosphere and its role; hydrological cycle

Eco system

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

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

Human activities

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

Natural resources	03 Hours

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

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

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

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

Forest Wealth - Components of the forest, key benefits of forests. Deforestationenvironmental effects of deforestation and remedies Sustainable developmentdefinition, objectives

Material cycles - Carbon, nitrogen and sulphur cycles.

UNIT – II

Environmental pollution: Definition, harmful effects related to 03 Hours public health

Water pollution:

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

Land pollution:

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

Air Pollution:

Definition, types and sources: industry, mining, agriculture, transportation and effects **Noise pollution**:

Definition, sources, mining, industries, rail-roads, aviation, effects and control measuresEnergy02 Hours

Different types of energy-

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

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

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

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

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

UNIT - III

Current environmental issues of importance

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

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

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

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

04 Hours

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

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

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓		Ļ
↓ Course Outcomes													1	2	3
21CV512.1		2						2					1		
21CV512.2				1						1			1		
21CV512.3	1				1								1		
21CV512.4	1			1									1		
21CV512.5			3								3		1		

1: Low 2: Medium 3: High

TEXTBOOKS:

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

REFERENCE BOOKS:

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

Ability Enhancement Course – V

1) 21CVA51 - Entrepreneurship Development and Small Business Management

2) 21CVA52 - Green Buildings

3) 21CVA53 - Software application in Civil Engineering

4) 21CVA54 - Innovations and Design Thinking

ENTREPRENEURSHIP DEVELOPMENT AND SMALL BUSINESS MANAGEMENT

Course Code:	21CVA51	Course Type	AEC
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Credits	01
Total Teaching Hours	25	CIE + SEE Marks	50+50

Teaching Department: Civil Engineering

Course Learning Objectives:

ENTREPRENEURSHIP

- Understand the information design and development in technical writings. 1.
- Acquire the knowledge of grammar and editing in technical writing. 2.
- 3. Comprehend the details of self-development and assessment in technical writing.
- Acquire the fundamental knowledge and importance of communication in 4. technical writings.
- 5. Gain the basic knowledge on ethics and report writing aspect of technical communication

UNIT - I

03 Hours Introduction, Meaning and Importance, Evolution of term 'Entrepreneurship', Factors influencing entrepreneurship', Psychological factors, Social factors, Economic factor, Environmental factors, Characteristics of an entrepreneur, Entrepreneur and Entrepreneur.

Types of entrepreneur, According to Type of Business, According to Use of Technology, According to Motivation, According to Growth, According to Stages

New generations of entrepreneurship viz. social entrepreneurship, Entrepreneurship, Health entrepreneurship, Tourism entrepreneurship, Women entrepreneurship etc, Barriers to entrepreneurship

Foundation of Entrepreneurship Development										02 Hours
Concept a	nd n	need	of	entrepreneurship;	Characteristics	and	Types	of	Entrep	reneurship;

Entrepreneurship as a career; Entrepreneurship as a style of Management; The changing role of the entrepreneur; Entrepreneurial traits, factors affecting entrepreneurs.

UNIT - II

Theories of Entrepreneurship

Influences on entrepreneurship development; External influences on entrepreneurship development; Socio-cultural, Political, economical, personal entrepreneurial success and failure: reasons and remedies; Women entrepreneurs: Challenges and achievements of women entrepreneurs.

Business Planning Process

The business plan as an entrepreneurial tool; Elements of business planning; Objectives; Market analysis; development of Product/idea; Marketing, Finance, Organization and management; Ownership; Critical risk contingencies of The proposal; Scheduling and milestones.

UNIT - III

Project Planning for Entrepreneurs

Technical, Financial, Marketing, Personnel, and management feasibility reports; Financial schemes offered by various financial institutions, Like Commercial Banks, IDBI, ICICI, SIDBI, SFCs, Foreign currency Financing; Estimation of Financial requirements.

Entrepreneurship Development and Government

Role of Central Government and State Government in promoting entrepreneurship with various incentives, subsidies, grants, programs, schemes and challenges. Government initiatives and inclusive entrepreneurial Growth.

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

- **1. Explain** the information design and development in technical writings.
- 2. **Illustrate** the knowledge of grammar and editing in technical writing.
- 3. Comprehend the details of self-development and assessment in technical writing.
- **4. Elucidate** the fundamental knowledge and importance of communication in technical writings.
- **5. Describe** the ethics and report writing aspect of technical communication.

03 Hours

03 Hours

02 Hours

02 Hours

Cours	Course Outcomes Mapping with Program Outcomes & PSO																
	Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12		PSO.	Ļ	
↓ Co	urse Outcomes													1	2	3	
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	21CVA51.2	-	1	-	-	-	-	-	-	1	3	-	-	2	-	-	
	21CVA51.3	-	1	-	-	-	-	-	-	1	3	-	-	2	-	-]
	21CVA51.4	1	1	-	-	-	-	-	-	1	3	-	-	2	-	-	
	21CVA51.5	-	1	-	-	-	-	-	3	1	3	-	-	2	-	-	
1: Low 2: Medium 3: High																	
TEXTBOOKS:																	
1.	Khanna, S. S., Entrepreneurial Development, S. Chand, New Delhi.																
2.	Hisrich D. Robert, Michael P. Peters, Dean A. Sheperd, Entrepreneurship, McGraw-																
	Hill,6 ed.																
3.	Zimmerer W. Thomas, I	Norr	man	М.	Scar	bor	oug	h, E	sser	tials	s of E	Intre	pren	eurs	hip a	ind	
	Small Business Manage	me	nt, F	PHI,4	ed.												
REFER	RENCE BOOKS:																
1.	Holt H. David, Entrepre	neu	rshi	p: N	ew \	/ent	ure	Cre	atio	n, P	renti	ce-⊦	lall o	of Inc	lia, N	lew	
	Delhi, Latest edition.																
2.	Kuratko, F. Donald, Rich	nard	M.	Hod	lget	ts, E	ntre	prei	neui	rship	o: Th	eory,	Pro	cess,	Prac	tice,	
	Thomson, 7ed.																
3.	Desai, Vasant, Dynamic	s of	Ent	repr	ene	ursh	ip: I	New	Ver	ntur	e Cre	eatio	n, Pre	entic	e-Ha	ill of	
	India, New Delhi, Latest	edi	itior) .													
4.	Roberts, Edward B.(ed.)	, Inr	lova	ition	: Dr	iving	g Pr	odu	ct, F	roc	ess, a	and M	Mark	et Cl	nang	e,	
	San Francisco: Jossey B	ass,	200	2.													

GREEN BUILDINGS									
Cour Teac	rse Code: hing Hours/Week (L: T: P: S):	21CVA52 1:0:0:0	Course Type: Credits:	AEC 01					
Tota	l Teaching Hours:	15+0+0	CIE + SEE Marks:	50+50					
	Teaching D	Department: Civil Ei	ngineering						
Cours	se Learning Objectives:								
1.	Understand the Definition, Con	ncept & Objectives	of the terms cost effective	/e					
	construction and green buildir	ng							
2.	2. Apply cost effective techniques in construction								
3.	Apply cost effective Technolog	gies and Methods in	Construction						
4.	Understand the Problems due	to Global Warming							
5.	State the Concept of Green Bu	ilding and Understa	and Green Buildings						
Intro	duction to the concept of cost	t effective constru	ction:	04 Hours					
Uses	of different types of materials a	nd their availability	-Stone and Laterite bloc	ks- Burned					
Bricks	5- Concrete Blocks- Stabilized M	lud Blocks- Lime Po	zolana Cement- Gypsum	Board-					
Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer									
Composite- Bamboo- Availability of different materials- Recycling of building materials –									
Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building									
mater	rials.								
Envir	onment friendly and cost effe	ective Building Tec	hnologies	04 Hours					
Differ	ent substitute for wall, construc	ction Flemish Bond	- Rat Trap Bond – Arche	s – Panels -					
Cavity	y Wall - Ferro Cement and Ferro	o Concrete constru	ctions – different pre cas	st members					
using	these materials - Wall and Room	f Panels – Beams – G	columns - Door and Win	dow frames					
- Wat	er tanks - Septic Tanks – Alterna	ate rooting systems	- Filler Slab - Composite	e Beam and					
Panel	Root -Pre-engineered and rea	ady to use building	elements - wood prod	ucts - steel					
and p	plastic - Contributions of agencie	es - Costford - Nirm	nithi Kendra - Habitat						
Globa	al Warming			04 Hours					
Defin	ition - Causes and Effects - Con	tribution of Building	gs towards Global Warmi	ng -					
Carbo	on Footprint – Global Efforts to i	reduce carbon Emis	sions Green Buildings – I	Definition -					
Features- Necessity – Environmental benefit - Economical benefits - Health and Social									
benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials Green									
Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of									
Buildi	ngs.								

G	reen	Building rating System	ms:													03	Hours
BF	BREEAM – LEED - GREEN STAR -GRIHA (Green Rating for Integrated Habitat Assessment)																
for new buildings – Purpose - Key highlights - Point System with Differential weight age.																	
Green Design – Definition - Principles of sustainable development in Building Design -																	
Characteristics of Sustainable Buildings – Sustainably managed Materials - Integrated																	
Lifecycle design of Materials and Structures (Concepts only)																	
Course Outcomes: At the end of the course student will be able to																	
1. Select different building materials for construction																	
2	2. Apply effective environmental friendly building technology																
3	8.	Analyze global warming due to different materials in construction															
4	.	Analyse buildings for g	reer	n rat	ting												
Course Outcomes Manning with Program Outcomes & PSO																	
		Program Outcomes \rightarrow	1	2	3	4	5	6	7	8	9	10	11	12		PSO	Ļ
	↓ Co	ourse Outcomes													1	2	3
		21CVA52.1	2	1				1	1						2	2	-
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		21CVA52.3	2	1				1	1						2	2	-
		21CVA52.4	2	1				1	1						2	2	-
-		21CVA52.5	2	1				1	1						1	3	-
<u> </u>		1: Low 2: Medium 3	: H	igh										•			<u> </u>
TI	EXTE	BOOKS:															
	1.	HarharaIyer G, Green Building Fundamentals, Notion Presses															
	2.	Dr. Adv. HarshulSavla,	Gre	en E	Build	ling	: Pri	ncip	les	& P	ract	ice					
E Books / MOOCs/ NPTEL																	
	1.	https://www.youtube.com/watch?v=THgQF8zHBW8															
	2.	https://www.youtube.com/watch?v=DRO_rIkywxQ															

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	SOFTWARE APPLICA	ATIONS IN	CIVIL ENGINEERI	NG														
Cour	rse Code:	21CVA53	Course Type	AEC														
Teac	hing Hours/Week (L: T: P: S)	2:0:0:0	Credits	01														
Total Teaching Hours15CIE + SEE Marks																		
	Teaching Dep	artment: Civ	il Engineering															
Course Learning Objectives:																		
1.	Understand the analysis by soft	ware tool.																
2.	2. Identify different types of methods of analysis using software.																	
3.	Analyse the strength of various types of structural members as per the codal																	
	provisions.																	
4.	Design the various civil Engineering structures using software.																	
UNIT - I																		
Struc	tural Analysis of Trusses and Be	ams		04 Hours														
Struct	Structural Analysis of 2D and 3D Trusses, Structural Analysis of Continuous Beams using for																	
differe	ent types of loadings and support	t conditions.	-	-														
Structural Analysis of Frames 03 Hours																		
Struct	Structural Analysis of 2D and 3D Rigid and Braced Frames for different types of loadings, support																	
condit	ions, section orientations and stiffnes	ss variation bet	ween columns and beams															
Analy	ais of Puildings																	
Struct	ural Analysis of one BHK Building			04 Hours														
Stuctural Analysis of one BHIC Bullding.																		
Desig	n of Structures using MS Excel			02 Hours														
Creati	ng Design spreadsheet for Beams, Sl	labs																
Design of Structures using MS Excel 02 Ho																		
Creati	ng Design spreadsheet for Columns,	Footings, and	Staircases															
Cours	a Outcomes. At the and of the cour	a student will	ha ahla ta															
1 Explain the types of analysis, structural analysis methods and procedure																		
2.	 Create 2D and 3D Models for analysis with various end conditions 																	
3.	3. Plan a column orientation for different types of buildings																	
4.	4. Design the analysed structures using MS Excel.																	
C		o Outcomes Monning w	+h 1	Duog		<u></u>	toor	200	<u>е.</u> П	50								
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	↓ Co	ourse Outcomes						_				_			1	2	3	
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		21CVA53.3	2	2	-	-	3	2	-	-	2	2	2	2	2	-	-	
		21CVA53.4	2	-	2	-	3	2	-	-	2	2	2	2	2	2	-	
		1: Low 2: Medium 3:	Hi	gh2														
T]	EXT	BOOKS:	_															
	1.	Punmia B. C., Ashok K	lum	ar Ja	in, A	Arun	Ku	mar	Jair	1, "S	Stren	igth o	of Ma	ateria	ls ar	nd Th	neory	of
		Structures", Volume I &	Vo	ume	e II, I	Laxr	nı P	ublı	catio	ons ((P) L	.td., 2	2019.					
	2.	Ramamrutham S., "Theory of Structures", Dhanpat Rai & Sons, New Delhi, 2018.																
	3.	N. Krishnaraju and R.N.Pranesh, Reinforced Concrete Design (IS456:2000)-Principles and																
		Practice, New Age Inter	nati	onal	Pub	lishe	ers, l	New	De	lhi, í	2006	5.						
D																		
R	EFE.	RENCE BOOKS:	1.	1 • .	1		• .	• ``	CD	1.0								
	1.	15: 456-2000 (to be sup)	olied	$\frac{1}{1}$ in t	ne e	xam	inat	$\frac{10n}{2}$	<u>, SP</u>	16. ·	C	0		C ((•	т	G
	2.	Dr. Ramchandra and Vi 456(2000), Scientific Du	renc	IraG	enio	t, Li	mit	Stat		esigi	n or	Conc	crete	Struc	ctures	s (As	per I	5:
	2	450-2000), Scientific Pt	10115 ;1 NA	ners	(Inc	11a),	JOU	ipui	; 20 tion	10. "" I	0.7.10		lichi	naC	0			
	<u>э.</u> Л	$\frac{\Gamma \text{ unifility D.C.}(2017)}{S \text{ Parametrization}} = \frac{1}{2} \frac{1}{$		no '	unes "The			truo	turo	<u>s</u> с"т	Jaxii Jhar	II F U		ng C ublief	0 hing	com	nonu	
	4.	New Delhi 2016	raya	uid,	1116	Jory	01.5	uuc	lule	5,1	Jiial	ipat r	ai r	uUIISI	unig	com	pany,	
		110 w Denn, 2010.																
E	E Books / MOOCs/ NPTEL																	
	1. https://nptel.ac.in/courses/105105166																	
	2.	https://nptel.ac.in/courses/105101085																

3. https://nptel.ac.in/courses/105105105

	INNOVATION	AND DESI	GN THINKING	
Cou	rse Code	21CVA54	Course Type	AEC
Теас	hing Hours/Week (L: T: P: S)	0:0:2:0	Credits	01
Tota	l Teaching Hours	15	CIE + SEE Marks	50+50
	Teaching Departr	ment: Mecha	nical Engineering	9
Cou	rse Learning Objectives:			
1.	To explain the concept o	f design thin	king for product ar	nd service
	development			
2.	To explain the fundamen	ital concept o	of innovation and c	design
	thinking			
3.	To discuss the methods of	of implement	ing design thinkin	g in the real
	world.			
	Note: Teaching-Learnin	ng Process (C	General Instructio	ns)
	These are sample Strateg	gies; which te	achers can use to a	accelerate
	the attainment of the val	rious course		
	outcomes.			
	1. Lecturer method (L) c	does not me	an only the traditi	ional lecture
	method, but a ifferent	type of teach	ning method may	be adopted
	to develop the outcome	S.		
	2. Show Video/animation	n films to exp	lain concepts	the stress
	3. Encourage collaborativ	ve (Group Lea	arning) Learning in	the class
	4. ASK at least three HO	is (Higher-or	der Thinking) que:	stions in the
	Class, which promotes cr) (DRL) which facto	rc ctudonts'
	Analytical skills dovelo	ns thinking	(FBL), which toste	o ability to
	Analytical skills, develo	d analyze in	formation rather	than simply
	recall it	u analyze in		
	6 Topics will be introduc	ed in multin	e representations	
	7 Show the different	ways to so	lve the same n	roblem and
	encourage the students	to come up v	with their own crea	ative ways to
	solve them.			
	8. Discuss how every cor	ncept can be	applied to the real	world - and
	when that's possible, it h	elps improve	the students' und	erstanding.

	List of Modules
1.	PROCESS OF DESIGN
	Understanding Design thinking
	Shared model in team-based design – Theory and practice in
	Design thinking – Explore the presentation
	Tools for Design Thinking
	Real-Time design interaction capture and analysis – Empathy
	for design
	Teaching-Learning Process
	Introduction about the design thinking: Chalk and Talk method
	Theory and practice through presentation
	Case studies on design thinking for real-time interaction and
	analysis
2.	Design Thinking in IT
	Design Thinking to Business Process modeling – Scenario-
	based Prototyping
	DT For strategic innovations
	Growth – Storytelling representation – Strategic Foresight -
	Change – Sense Making – Maintenance - Relevance – Value
	redefinition - Extreme Competition – experience design -
	Standardization – Humanization - Creative Culture – Rapid
	prototyping, Strategy and Organization – Business Model
	design.
	Teaching-Learning Process
	Case studies on design thinking and business acceptance of
	the design
	Business model examples of successful designs
3.	Design thinking workshop
	Design Thinking Workshop Empathize, Design, Ideate,
	Prototype and Test
	Teaching-Learning Process
	Presentation by the students on the success of Live project on
	design thinking in a group of 4 students

1. Low 2. Medium 3. High

Course Outcomes: Upon the successful completion of the course, students will be able to:

- **1.** Appreciate various design process procedure
- **2.** Generate and develop design ideas through a different techniques
- **3.** Identify the significance of Design Thinking to Understand products

Course Outcomes Mapping with Program Outcomes & PSO

Program	1	2	3	4	5	6	7	8	9	10	11	12	F	PSO.	↓
Outcomes→															
↓ Course Outcomes													1	2	3
21CVA54.1	2	-	2	-	-	-	1	-	-	-	-	-			
21CVA54.2	-	-	-	-	-	-	2	2	-	-	-	-			
21CVA54.3	-	_	-	-	-	-	-	-	-	3	3	-			

1. LOW 2. Mcalain 5. Mgh
E MATERIALS:
John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson,
"Engineering Design", Cengage learning (International edition),
Second Edition, 2013.
Roger Martin, "The Design of Business: Why Design Thinking is
the Next Competitive Advantage", Harvard Business Press,
2009.
Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design
Thinking: Understand – Improve– Apply", Springer, 2011.
Idris Mootee, "Design Thinking for Strategic Innovation: What
They Can't Teach You at Business or Design School", John Wiley
& Sons, 2013.
Yousef Haik and Tamer M. Shahin, "Engineering Design
Process", Cengage Learning, SecondEdition, 2011.
Jeanne Liedtka, Andrew King, Kevin Bennett, "Solving Problems
with Design Thinking - Ten Stories of What Works", Columbia
Business School Publishing, 2013.
25
www.tutor2u.net/business/presentations/.
/productlifecycle/default.html
https://docs.oracle.com/cd/E11108_02/otn/pdf/.
/E11087_01.pdf
www.bizfilings.com > Home > Marketing > Product Developmen

4.	https://www.mindtools.com/brainstm.html
5.	https://www.quicksprout.com/. /how-to-reverse-engineer-
	your-competit
6.	www.vertabelo.com/blog/documentation/reverse-engineering
	https://support.microsoft.com/en-us/kb/273814
7.	https://support.google.com/docs/answer/179740?hl=en
8.	https://www.youtube.com/watch?v=2mjSDIBaUIM
	thevirtualinstructor.com/foreshortening.html
	https://dschool.stanford.edu//designresources//ModeGuide
	BOOTCAMP2010L.pdf
	https://dschool.stanford.edu/use-our-methods/ 6.
	https://www.interactiondesign.
	org/literature/article/5-stages-in-the-design-thinking-process
	7.
	http://www.creativityatwork.com/design-thinking-strategy-for-
	innovation/ 49 8.
	https://www.nngroup.com/articles/design-thinking/ 9.
	https://designthinkingforeducators.com/design-thinking/ 10.
	www.designthinkingformobility.org/wp-
	content//10/NapkinPitch_Worksheet.pdf
9.	Activity Based Learning (Suggested Activities in Class)/
	Practical Based learning
	http://dschool.stanford.edu/dgift/

DESIGN OF ST	EEL STRUCTUR	AL ELEMENTS						
Course Code:	21CV601	Course Type:	PCC					
Teaching Hours/Week (L: T: P: S):	3:0:0:0	Credits:	03					
Total Teaching Hours:	40+0+0	CIE + SEE Marks:	50+50					
Prerequisite								
Teaching Department: Civil Engineering								

Course Learning Objectives:

1.	Understand the behavior of different types of steel structures
2.	Identify different types of sections used in steel construction
3.	Assess the strength and stability of components of steel structures
4.	Analyse the strength of various types of members as per the codal provisions
5.	Study the concepts of Design the structural components, viz., tension members,
	compression members, flexural members, column bases, bolted and welded connections
	using IS800:2007, steel tables and they are to Understand the importance of steel
	structures and their connections.

UNIT - I

16 Hours

INTRODUCTION: Advantages and disadvantages of steel structures, failure criteria for steel, IS codal provisions, section classification.

BOLTED CONNECTIONS: Advantages and disadvantages, Design strength of HSFG bolts, design of simple bolted connections (lap and butt), bracket connections.

WELDED CONNECTIONS: Advantages and disadvantages, strength of welds, design of simple welded connections.

Limit State Method of design, Types of welds, defects in welds

UNIT - II

14 Hours **DESIGN OF TENSION MEMBERS:** Modes of failure, design of axially loaded tension members and their connections.

DESIGN OF COMPRESSION MEMBERS: Modes of failure, Design of single angle struts, compression members, Design of built up compression members.

COLUMN BASES: Design of simple slab base, gusseted base.

UNIT - III

DESIGN OF FLEXURAL MEMBERS: Types of beams, Modes of failure, Design strength of laterally supported and unsupported beams in bending and shear, Maximum deflection, Design of laterally supported and unsupported beams.

TYPES OF CONNECTIONS: Bracket connections - bolted and welded.

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

- **1.** Explain the basic design philosophy to analyze and design the bolted and welded connections, as per IS 800:2007 guidelines.
- **2.** Analyze and design the tension and compression members with connections for the failure mechanisms.
- **3.** Analyze and design the compression, built-up compression members with slab base and gusseted base connection.
- **4.** Design laterally restrained and unrestrained beams and check the adequacy.
- 5. Analyze and design bolted and welded bracket connections,

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
21CV601.1	1	2	3	-	-	-	-	1	1	-	-	-	3	2	2
21CV601.2	1	2	3	-	-	-	-	1	1	-	-	-	3	2	2
21CV601.3	-	2	3	-	-	-	-	1	1	-	-	-	3	2	2
21CV601.4	1	2	3	-	-	-	-	1	1	-	-	-	3	2	2
21CV601.5	-	2	3	-	-	-	-	1	1	_	-	-	3	2	2
1								-					-		

1: Low 2: Medium 3: High

TEXTBOOKS:

- **1.** N. Subramanian, "Design of Steel Structures", Oxford University Press, 2014.
- 2. S. K. Duggal, "Limit State Design of steel structures", Tata McGraw Hill, 2013.

REFERENCE BOOKS:

1.	S. S. Bhavikatti, "Design of Steel Structures by Limit State Method as per IS 800: 2007",
	I.K. International Publishing House Pvt. Ltd., 2013.
2.	IS – 800: 2007, Steel tables (to be supplied in examination).
3.	V. L. Shah and Veena Gore, "Limit State Design of Steel Structures (IS 800: 2007)",
	Structures Publications, Pune, 2010.
4.	Ram Chandra and Virendra Gehlot, "Limit State Design of Steel Structures", Scientific
	Publishers (India), 2013.

E Books / MOOCs/ NPTEL

1. http://nptel.ac.in/courses/105103094/

2. http://nptel.ac.in/courses/105106112/

ENGINEERIN	G PROJECT	MANAGEMENT	
Course Code:	21CV602	Course Type	PEC
Teaching Hours/Week (L: T: P: S)	3:0:0:0	Credits	03
Total Teaching Hours	40	CIE + SEE Marks	50+50
Teaching D	epartment: Civ	vil Engineering	
Course Learning Objectives:			

1.	Understand various organizational forms/structures Bar charts, Milestone charts and
	Work breakdown structure. Have the knowledge of Activity, Event, Different type of
	floats, Forward pass, Backward pass.
2.	Construction of network diagrams, Determine activity start and finish times. Know
	about CPM, the project management tool
3.	Know three time estimates referring to PERT, Scheduling, Monitoring and Updating.
	Resource Planning-leveling and allocation.
4.	Acquire the knowledge of Cost control in construction, Linear programming,
	Transportation models.
5.	Know about Material Management, Store management, Purchase management and
	Inventory control management.

UNIT - I

07 Hours

Project Organization, Formal and Informal organization, Organization Structures, Bar chart, Milestone chart, Work Breakdown Structure, Cost breakdown structure. Activity and event, Activity start and finish times, Forward and backward pass, Floats – Definition, Different types.

Line and staff organizations, AON & AOA diagrams.

Project Planning

Project Organization

Network Analysis, Construction of network diagrams using predecessor relationships,																				
Fulkerson's rule of	f numbe	ering	j eve	ents,	CPI	N A	halys	sis –	Sigi	nific	ance.									
Determination of	Earliest	and	Late	est E	ven	t Tin	nes,	Crit	ical I	Path	and	variou	ıs floa	its.						
						UN	IT -	II												
Project Monitori	ng											06 H								
PERT Analysis - I	mportar	nce,	Tim	ne E	stim	ates	-Ор	timi	stic	tim	e, Pes	ssimis	tic tin	ne, most likely						
time, Scheduling,	Monito	ring	and	Up	datiı	ng. L	ine	of B	alan	ce S	ched	uling.								
Resource Planning	g-levelir.	ng A	lloca	atioi	n, In	trod	uctio	on te	o Ris	sk M	anag	emen	t, Risk	c Register.						
Project Control														09 Hours						
Project cost analy	sis, Time	e-Co	ost Ti	rade	e-off	. Cos	st Co	ontro	ol in	Cor	nstruc	tion,	Linear							
programming-Graphical method.																				
Theory of simplex	(method	d, Tr	ansp	port	atio	n ma	odel	5												
						UN	T - 1	III												
Material Manage	ement									_				09 Hours						
Material Managei	ment- So	cop	e, ot	oject	tives	and	d tur	nctic	ons,	Stor	e Ma	nager	nent-	Objectives and						
functions, Purchas	se mana	gen	nent	anc	1 inv	ento	ory c	conti	rol N	/lana	gem	ent.								
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Course Outcome	s: At the	e en		the	cou	rse s	stua	ent	WIII	be a	ble to)								
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2. To analyze	and so	lve .	prob	lem	s or	n act	IVITIE	es ar	nd e	vent	S		1.							
3. 10 determ	ine the	proj	ecto	com	piet	ion	perio	od a	na t	0 es	tima	te the	prob	ability of						
	g the pro	ojec	t WIT	nin	the :	spec	tinec	a pe	rioa		4 4 a al			l						
4. 10 optimiz	e the pi	roje		ost a	na c	ura	tion	by t	ime	COS		e ott	metho							
5. 10 apply ti	ne know	leag	ge to	o pro	ocur	e an	a m	ana	ge n	nate	rial to	or the	proje	ct.						
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Course Outcome	s iviapp	ing	wiτ	n Pr	ogra	am (Outo	com	es c	2 23	10		10							
Pro	ogram	T	2	3	4	5	6	/	8	9	10	11	12	PSO↓						
Outcor	mes→																			
↓ Course														1 2 3						
Outcomes																				
21CV602.1		3		2										3 2						
21CV602.2		2		2										3 2						
21CV602	.3	2		2										3 2						
21CV602	.4	2		2										3 2						
21CV602	.5	2		2										3 2						
			I		1	I	I	I	I	I	1	1	1							

1: Low 2: Medium 3: High

TEXTBO	OKS:
1.	Peurifoy. R L, "Construction Planning, Equipment and Methods", Mc Graw Hill.
	(March 2010)
2.	Srinath L.S, "PERT and CPM", East West Press Private Ltd New Delhi. (2010)
REFEREN	ICE BOOKS:
1.	Frank Harris and Ronald McCaffer, "Modern Construction Management", 6 th Ed.,
	Blackwell Science Ltd. (March 2013).
2.	B.C Punmia, "Pert and CPM', Lakshmi publication.(December 2001)
3.	Paul Harris, Planning & Control Using Microsoft Project (2016)
4.	Chatfield, Johnson Microsoft Project 2016 Step By Step (2016)
5.	Construction Planning and Management Paperback by U K Srivastava (May 2000)
E Books	/ MOOCs/ NPTEL
1.	https://onlinecourses.nptel.ac.in/noc17ce16

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CONCRETE TECHNOLOGY

Course Code: 21CV62	21CV603	Course Type:	PCC
Teaching Hours/Week (L:T:P: S):	3:0:0:0	Credits:	03
Total Teaching Hours:	40	CIE + SEE Marks:	50+50

Teaching Department: Civil Engineering

Course Learning Objectives: This Course will enable students to:

- **1.** Study the chemical composition, types and tests on cement.
- 2. Learn different types of aggregates and admixtures
- **3.** Comprehend the properties of fresh concrete, & manufacturing process of concrete
- **4.** Understand the properties, testing and study the durability of hardened concrete
- 5. Understand the concept of mix design of concrete and know various types of special concretes, smart materials & their applications.

UNIT - I

INGREDIENTS:

CEMENT: Types and their use (Portland cement-chemical composition, properties, hydration and manufacture process. Fineness, compressive strength, setting time and soundness tests as per BIS.

AGGREGATES: Properties of coarse and fine aggregates and their influence on concrete.

WATER: quality and permissible impurity limits as per BIS

ADMIXTURES: Chemical: accelerators, retarders, air entraining agents, plasticizer and super-plasticizer, tests on admixture, chemistry and compatibility with concrete.

Mineral: fly ash, silica fumes, rice husk ash and blast furnace slag.

16 Hours

UNIT - II

FRESH CONCRETE: Introduction to workability-factors affecting, measurement (slump, compaction factor, flow and Vee Bee consistometer), segregation and bleeding, process of manufacture-batching, mixing, transporting, placing, compaction, finishing and curing.

HARDENED CONCRETE: Factors affecting strength: w/c ratio, gel/space ratio and maturity concept, testing of hardened concrete: destructive methods-compressive strength, split tensile strength and flexural strength, non-destructive methods-rebound hammer and pulse velocity.

DURABILITY: Definition and significance, chemical attack-sulphate attack, chloride attack, carbonation, freezing and thawing.

15 Hours

UNIT – III

CONCRETE MIX DESIGN: Objectives, factors affecting and BIS method.

INTRODUCTION TO SPECIAL CONCRETES: High volume fly ash concrete, light weight concrete, high density concrete and self-compacting concrete: materials, properties and applications

SMART MATERIALS: Introduction to smart materials, types and their applications.

Cour	se Outcomes: At the end of the course student will be able to
1.	Explain the types, hydration mechanism and tests on cement as per BIS.
2.	Describe the properties, their influence on concrete as per BIS and analyze the effect of chemical and mineral admixtures.
3.	Explain the manufacturing process and determine the fresh concrete behavior.
4.	Explain the properties, testing procedure and assess the durability of hardened concrete.
5.	Design standard grade conventional concrete mix proportions as per BIS and identify the suitability of special concretes and smart materials based on their application.
· · · · · ·	

Cour	rse Outcomes Mapp	ing	j wi	ith	Pro	gra	m (Out	cor	nes	5 & F	SO				
	Program	1	2	3	4	5	6	7	8	9	10	11	12	F	SO,	\downarrow
	Outcomes→															
↓ (Course Outcomes															
	21CV603.1	2	2	1									1	2	1	
	21CV603.2	2	2	2									1	2	1	
	21CV603.3	2	2	2									1	2	1	
	21CV603.4	2	2	2									1	2		
															1	
	21CV603.5	3	2	3			1		2				2	3	2	
	1: Low 2: Mediu	m 3	3: H	ligł	ו											
TEXT	FBOOKS:															
1	MS Shetty, (20	14)). ``(Cor	ncre	ete	Te	chn	olo	рgy	- Th	eory	/ an	d Pr	act	ice",
	S Chand and Co	om	par	٦y,	Ne	wD	Dell	ni.								
2	Gambhir ML (201	3). (Cor	ncre	te T	ech	nol	ogy	/: Tl	neo	ry ar	nd Pr	actic	e, D	han	pat
	Rai and Sons, Nev	٧D	elhi	i.												
REFE	RENCE BOOKS:															
1	Adam M. Neville	and	J. J	. Br	ook	is (2	2018	3). "	Cor	ncre	ete Te	echn	olog	y", P	rent	tice
	Hall															
2	R Santhakumar (2	012	2). "	Cor	ncre	te -	Tech	nno	log	y", (Dxfo	rd Ui	niver	sity	Pres	SS
	India															
3	Relevant IS codes	•														
E Bo	oks / MOOCs/ NPT	EL														
1	https://nptel.ac	c.in	/cc	ours	ses	/10)5/	102	2/1	051	1020)12/				
2	https://nptel.ac.in/courses/105/104/105104030/															

COMPUTER AIDED DETAILING OF STRUCTURE

Cour	se Code:				2	1CV	604	C	Cour	se Typ	oe:			PCC L	ab
Teac	ning Hours/Week (L: T: P: S):				(0:0:2	2:0	C	Cred	ts:				01	
Total	Teaching Hours:					26		C	CIE +	SEE I	Marks	5:		50+50)
	Teacl	hing D	epar	tme	nt: (Civil	Eng	jine	erin	9					
Cour	se Learning Objectives:														
1.	To know the structural det	ailing o	of RC	C str	uctu	res.									
2.	To know the structural det	ailing o	of St	eel s	struc	tura	ıl ele	eme	nts.						
		Li	st o	f Ex	peri	me	nts								
1.	Detailing of RC structure	es using	g Aut	to Ca	ad –	Bea	ms (Two	dra	wings	;)				
2.	Detailing of RC structure	es using	g Aut	to Ca	ad –	Bea	m ar	nd sl	ab (Two d	drawi	ngs)			
3.	Detailing of RC structure	es using	g Aut	to Ca	ad –	Colu	umn	s an	d fo	oting	(Two	drav	vings	5)	
4.	Detailing of RC structure	es using	g Aut	to Ca	ad –	Mat	fou	ndat	tion	(Two	draw	vings)			
5.	Detailing of Steel Structu	ure usir	ng Ai	uto (Cad ·	– Sir	nple	Sea	ted	Conn	ectio	n an	d Cle	ated	
	Connection														
6.	Detailing of Steel Structu	ure usir	ng Ai	uto (Cad ·	– Be	am t	o Be	eam	conn	ectio	n			
7.	Detailing of Steel Structu	ure usir	ng Ai	uto (Cad ·	– Be	am t	o Co	olun	nn Co	nnec	tion			
8.	Detailing of Steel Structu	ure usir	ng Ai	uto (Cad ·	– Sla	ıb Ba	ase							
9.	Detailing of Steel Structu	ure usir	ng Ai	uto (Cad ·	– Gu	isset	ed E	Base						
10). Detailing of Steel Structu	ure usir	ng Ai	uto (Cad ·	– Sir	nple	Tru	ss er	nd co	nnect	tion			
Cour	se Outcomes: At the end	of the	coui	rse s	tud	ent	will	be a	able	to					
1.	Analyze and Sketch the stru	uctural	deta	iling	of F	RC st	ruct	ures	•						
2.	Analyze and sketch the stru	uctural	deta	iling	of S	teel	stru	ctur	al el	emen	its.				
Cour	se Outcomes Mapping w	ith Pro	ogra	am (Dute	com	es 8	<u></u> ያ ይ	50						
	Program Outcomes→	1 2	3	4	5	6	7	8	9	10	11	12		PSO	ł
↓ Co	ourse Outcomes												1	2	3
	21CV604.1	1 2	1	2	1				1				1	2	1
	21CV604.2	1 2	1	2	1				1				1	2	1
	1: Low 2: Medium 3:	High													

REFERE	NCE BOOKS:
1.	N. Krishnaraju and R.N.Pranesh, Reinforced Concrete Design (IS456:2000)-Principles and
	Practice, New Age International Publishers, New Delhi, 2006.
2.	Dr. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Limit State Design of Reinforced
	Concrete, Laxmi Publications (P) Limited, New Delhi, 2007.
3.	Dr. Ramchandra and Virendra Gehlot, Limit State Design of Concrete Structures (As per IS:
	456-2000), Scientific Publishers (India), Jodhpur, 2010.
4.	S. N. Sinha, Reinforced Concrete Design, Tata- McGraw Hill Publishing Company Limited,
	New Delhi, 2014.
5.	Dr. P.C. Varghese, Limit State Design of Reinforced concrete, 2nd Edition, Prentice Hall of
	India Private Limited, 2004.
6.	IS: 456-2000 (to be supplied in the examination), SP16.
E Resou	rces
1.	https://nptel.ac.in/courses/101/104/105105105/

MINI PROJECT

Course Code:	21CV605	Course Type	PRO
Teaching Hours/Week (L: T: P: S)	0:0:2:0	Credits	02
Total Teaching Hours	-	CIE + SEE Marks	50+50
Prerequisite			

Course Learning Objectives:

1. The mini project work needs to be completed with a goal to strengthen the understanding of student's fundamentals through effective application of theoretical and practical concepts.

The Mini project work involves the following:

The mini project work needs to be completed with a goal to meet the objectives of the course and the topics involving at least one software use for design & analysis would be preferable.

A report highlighting the design finalization [based on functional requirements & standards (if any)] Fabrication, assembly, testing and performance analysis of the designed project

A presentation including Implementation Phase (Hardware / Software / both), Testing & Validation of the developed system, Learning in the Project and Consolidated report preparation.

Topics involving at least one software use for design & analysis would be preferable and students are required to prioritize them during the tenue of the mini project. In the present-day scenario domain-specific jobs requires students to visualize, analyze, and communicate for which project-based learning will be a foundation.

According to type of applications to be solved in field of Electronics and communication, software can be classified into two categories, 1. Simulation using Cadance, Matlab, etc 2. Implementation of software using C, C++, Python and other similar programming languages

Each Student should meet respective guide every week as per time table schedule during the course of the project. A mandatory attendance register shall be maintained by the respective guide/s. Students should maintain a minimum of 75% attendance to get the eligibility for final presentation.

Assessment Details (CIE Only)

The internal assessment marks for Mini Project work shall be awarded by giving weightage of 50% to continuous evaluation done during the entire semester and 50% weightage to the final evaluation by the Project Guide/s. Internal assessment would be strictly based on attendance, performance and presentations.

Semester End Examination:

CIE procedure:

i)Single discipline: Contribution to the project and the performance of each group member shall be assessed individually in Continuous Internal Evaluation (CIE) conducted at the department.

ii) Interdisciplinary: Contribution to the project and the performance of each group member shall be assessed individually in Continuous Internal Evaluation (CIE) conducted separately at the departments to which the student/s belong to.

SCHEME OF EVALUATION: Project demonstration, Viva voce Total marks: 50 Marks

The distribution of marks shall be proportioned based on the type of the project and it is based on fulfilling the following requisites.

The evaluation of students is proposed to be done by internal faculty. The evaluation may be based on following criteria:

- Sense of Responsibility
- Clarity of concepts, principles and procedures
- Self-expression/communication skills
- Report Writing Skills
- Creativity/conceiving new and unusual ideas
- Problem-solving skills

At the end of the project work course students are required to submit a working model of the equipment they have designed and developed or if it is a theoretical or experimental work, they are expected to study a detailed analysis and findings from their work.

Course Outcomes: At the end of the course student will be able to									
e the	a system based on the requirements; implement, test and analyse the system.	1.							
	ent the work done.	2.	_						
			-						
	ng with Program Outcomes & PSO	Course	_						
	ent the work done. ng with Program Outcomes & PSO	2. Course							

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12		Р	SO↓
↓ Course Outcomes													1	2	3
21CV605.1	3	2	2	3	3	2	2	2	3	1	3	3	3	З	3
21CV605.2	1	1	1	1	1	1	1	1	3	3	1	3	3	3	3
											4		84.1		112.1.

1: Low 2: Medium 3: High

INTERNSHIP II

Cour	se Code:			2	1IN7	61		Co	ours	е Ту	ре			Ρ	RO	
Teac	hing Hours/Week (L: T: P: S	5)		-				С	redit	S				03	3	
Tota	Teaching Hours			-				CI	E +	SEE	Mark	s		5)+50	
<u>Cour</u>	Course Learning Objectives:															
1.	This course is meant	to	prov	/ide	stu	ıder	nts a	an a	aver	nue	to ι	unde	rstan	nd th	ne w	ork
	environment, ethics a	and	pra	actic	es	in a	an	indu	ustr	y/or	gani	zatic	n a	nd t	ake	up
	assignments/jobs in th	e fu	iture	Э.												
Cour	se Outcomes: At the en	nd o	f the	e co	urse	e sti	ıder	nt w	ill b	e al	ole te	С				
1.	Analyse and Develop	tech	nica	al sc	oluti	ons	for	as	pec	ific	prot	olem	that	is a	ssigr	ned
	to them.															
2.	Communicate ideas t	hat	are	de	velo	pe	d th	nrou	ıgh	bra	insto	ormir	ng, p	orese	entat	ion
	and prepare a report.															
3.	Understand and inculo	ate	indu	ustry	y pr	acti	ces	in tl	heir	pro	fessi	ional	care	er.		
Cour	se Outcomes Mapping	wit	th P	rog	ram	1 Oı	utco	ome	s &	PS	0					
	Program Outcomes→	1	2	3	4	5	6	7	8	9	1	1	1		PS	iO ↓
	↓ Course Outcomes										0	1	2	1	2	3
	21CV606.1	3	2	-	-	1	1	-	-	2	3	1	-	1	1	1
	21CV606.2	3	2	-	-	1	1	-	-	2	3	1	-	1	1	1
	21CV606.3	3	2	-	-	1	1	-	-	2	3	1	-	1	1	1
										1	: Lo	w 2:	Med	lium	3: H	ligh

	Professional Elective Course - 1 (Group 1)
Course	Course Title
Code	
Stream – St	tructural Engineering
21CVE101	Design of Masonry Structures
21CVE102	Matrix Methods of Structural Analysis
21CVE103	Theory of Elasticity
21CVE104	Structural Dynamics
21CVE105	Design of Prestressed Concrete Structures
Stream – G	eotechnical and Transportation Engineering
21CVE301	Ground Improvement Techniques
21CVE302	Traffic Engineering
21CVE303	Highway Geometric Design
21CVE304	Earth Retaining Structures
21CVE305	Road Safety and Management
Stream – C	onstruction Technology and Management
21CVE501	Alternative Building Materials and Technologies
21CVE502	Advanced Concrete Technology
21CVE503	Building Services
21CVE504	Construction Planning & Control
21CVE505	Construction Quality Management
21CVE506	Construction Methods and Equipments
Stream – W	ater Resources Engg, Environmental Engg. &
Geology	
21CVE701	Ground Water Hydrology & Exploration
21CVE702	Environmental Impact Assessment for Civil
	Engineering
21CVE703	Rural Water Supply & Sanitation
21CVE704	RS & GIS application in Water Resource Engg
21CVE705	Advanced Hydraulics
Stream – S	oftware Oriented Courses in Civil Engineering
Stream	
21CVE901	3D BIM - Autodesk Revit
21CVE902	CAD in Civil Engineering
21CVE903	Fundamentals of Machine Learning
21CVE904	Python Programming
21CVE905	GIS with Quantum GIS

Elective Groups for 6th Semester B.E.

Professional Elective Course - 1 (Group 1)

DESIGN OF MASONRY STRUCTURES

Course Code	21CVE101	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to

- 18 Know about 'Masonry', its use, advantages and disadvantages
- 19 Have clear knowledge of different types of 'Masonry units', types and grades of 'Mortar' as per IS Code, properties of masonry units and mortar.
- 20 Know the strength of masonry unit and masonry prism, computation of permissible strength of masonry for different types of masonry structures considering factors like 'Effective height',' Effective length', 'Slenderness ratio' and 'Eccentricity ratio'.
- 21 Design different types of masonry structures selecting suitable masonry units and mortar using IS 1905 (revised in 2002) and SP 20.
- 22 Know about the use of (i) Reinforced Masonry, (ii) Composite Masonry (iii) Confined Masonry and (iv) 'In filled frames', their advantages and disadvantages.

UNIT – I

MASONRY UNITS, MATERIALS, TYPES & MASONRY CONSTRUCTION

Brick, stone and block masonry units – strength, modulus of elasticity, water absorption and uses.

Mortar: classification and properties, selection.

Defects and errors in masonry construction cracks in masonry, types, reasons for cracking, methods of avoiding cracks.

Strength and Stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship, strength formulae and mechanism of failure for masonry subjected to direct compression.

15 Hours

UNIT – II

PERMISSIBLE STRESSES

Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses.

Load considerations for masonry: walls carrying axial load, eccentric load with different eccentric ratios—walls with openings and free standing wall.

Design considerations: Effective height of walls and columns, opening in

walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action and lintels.

15 Hours

UNIT – III

Design of load bearing masonry walls for building up to 3storeys using IS 1905 and SP20 procedure.

Reinforced masonry and its application, flexural and compression elements of reinforced masonry, shear walls.

Composite masonry walls, composite wall beam elements, infilled frames.

10 Hours

Course Outcomes:

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

- 1. **Explain** the types, properties, uses, defects, crack and its remedial measures in masonry structures)
- 2. **Analyze** the emerging permissible compressive, tensile and shear stress and factors influencing them for masonry elements.
- 3. **Explain** permissible stresses and design criteria as per IS: 1905 and SP-20.
- 4. **Determine** the effective height of walls, columns, effective length, effective thickness of wall and factors affecting them.
- 5. **Analyze and design** load bearing masonry walls for buildings up to three stories using IS: 1905 and SP-20 and **understand** the concept of reinforced masonry.

Course Articulation Matrix:

				_											
со	P01	P02	PO3	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PSO1	PSO2	PSO3
CO1	1	2	1										1	2	
CO2	1	2	1										1	2	
CO3	1	2	3										1	2	
CO4	1	2	3										1	2	
CO5	1	2	3										1	2	2
						<u> </u>				•	•	•		•	

Note: 1: Low 2: Medium 3: High

TEXTBOOKS:

- 1. Henry A. W., (1990), "Structural masonry", Macmillan Education Ltd.
- 2. Dayarathnam P., (1987), "Brick and reinforced brick structures", Oxford & IBH Publication.
- 3. M. L. Gambhir, Building and Construction Materials (2017), Mc Graw Hill education Pvt. Ltd.

REFERENCE BOOKS:

- 1. Sinha, B.P and Davies, S.R (1997), "Design of Masonry Structures", E & FN spon.
- 2. IS 1905-1987 (3rd revision), "Code of practice for structural use of unreinforced masonry", BIS, New Delhi.
- 3. SP 20 (S& T) 1991, "Hand book on Masonry Design and Construction (1st revision)", BIS, New Delhi.
- 4. R E Klingner 2010 Masonry structural design, McGrawHill Companies, Inc. New York, pp 588.
- 5. National Building Code of India 2016 Vol.1, Part 6 Section 4 Structural Design Masonry.

NPTEL SOURCE:

1) https://nptel.ac.in/courses/105/106/105106197/

MATRIX METHODS OF STRUCTURAL ANALYSIS

Course Code	21CVE102	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students:

- 1. To **define** the flexibility and **development** of flexible matrix for defined coordinates for structural system.
- 2. To **analyze** the trusses, continuous beams and rigid plane frames by flexibility matrix method.
- 3. To **define** the stiffness and **development** of stiffness matrix for the defined coordinates for structural system.
- 4. To **analyze** the trusses, continuous beams and rigid plane frames by stiffness matrix method.
- 5. To **summarize** the direct stiffness method, local and global coordinates and **analyze** the trusses, continuous beams and rigid frames.

UNIT – I

Introduction to flexibility method, Element flexibility matrix, Principle of contragradience, and Force Transformation Matrix, Member Flexibility matrix, Construction of structure flexibility matrix. Matrix determination of the displacement vector, Determination of member forces. *Analysis of trusses by*

flexibility method using force transformation matrix. Analysis of axially rigid continuous beams and rigid plane frames with axially rigid members by flexibility method using Force transformation Matrix.

16 Hours

UNIT – II

Fundamentals of the stiffness method, equivalent joint loads, Displacement Transformation matrix. Member stiffness matrix, Total or System stiffness matrix, *Truss analysis by stiffness method using Displacement Transformation Matrix*. Continuous Beam and *rigid frame analysis with axially rigid members by stiffness method using displacement transformation matrix.*

15 Hours

UNIT -III

Introduction to direct stiffness method, local and global co-ordinate system, transformation of variables, transformation of the member displacement matrix, force matrix, stiffness matrix, transformation of the stiffness matrix of the member of a truss, transformation of the stiffness matrix of the member of the rigid frame, overall stiffness matrix, boundary conditions, computation of internal forces.

Analysis of pin jointed truss, rigid plane frames and continuous beams by direct stiffness method.

9 Hours

NOTE:

- 1. Determination of member forces, displacement and reactions using matrices only
- 2. Number of indeterminacy shall be \leq 3 (for paper setting)

Course Outcomes:

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

- 1. **Define** flexibility matrix and **develop** flexibility matrix for assigned coordinates.
- 2. **Determine** the member forces in trusses, **analyze** continuous beams and rigid plane frames by flexibility matrix method.
- 3. **Define** stiffness matrix and **develop** stiffness matrix for assigned coordinates.
- 4. **Determine** the member forces in trusses, **analyze** continuous beams and rigid plane frames by stiffness matrix method
- 5. **Analyze** the trusses, continuous beams and rigid plane frames by direct stiffness method.

Mapping of POs & COs:

CO	P01	PO2	PO3	P04	P05	P06	P07	P08	PO9	P010	P011	P012	PSO1	PSO2	PSO3
C01	1	2										1	2	3	
C02	2	3										1	3	1	2
CO3	1	2										1	2	3	
C04	2	3										1	3	1	2
C05	2	3										1	3	1	2

Note: 1: Low 2: Medium 3: High

TEXTBOOKS:

- 1. W. Weaver J.M. Gere, (1986), "Matrix Analysis of framed structures", CBS publishers and Distributors.
- 2. S Rajshekharan. G Sankara Subramanian, (2010), "Computational Structural Mechanics", PHI.

REFERENCE BOOKS:

- 1. L. S. Negi and R S Jangid, (1997), "Structural Analysis", Tata Mc Graw-Hill.
- 2. H C Martin, (1996), "Introduction to Matrix Methods of Structural Analysis", International Text Book Company.
- 3. R. Vaidyanathan, P.Perumal, (2007), "Comprehensive Structural Analysis– Volume I", Laxmi Publications (P) Limited.
- 4. S.S.Bhavikatti, (2013), "Matrix Methods of Structural Analysis", I.K. International Publishing House Pvt. Ltd.

THEORY OF ELASTICITY

Course Code	21CVE103	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to

- 1. Understand the concept of plane stress and plane strain problems.
- 2. Develop compatibility equations for strains and strain measurements.
- 3. Formulate and solve two dimensional problems in case of bending and develop Airy's stress function equations
- 4. Derive compatibility equations in polar coordinates.
- 5. Analyze the stress distribution in axisymmetric problems and the effect of circular hole on the stress distribution.

UNIT – I

Introduction to elasticity *:stress and strain relations*, mathematical theory continuum, stress and strain at a point, constitutive laws, generalized Hooke's law, strain-displacement relations, stress tensor, stress transformation, stress invariants, strain tensor, strain invariants, plane stress and plane strain, principal stresses and strains.

Analysis of strain: Formation and solutions to differential equations, measurement of surface strains – strain rosettes, compatibility concept – need and physical significance, compatibility equation in terms of strains.

15 Hours

UNIT – II

Two dimensional problems in Cartesian coordinates: compatibility equations for plane stress and plane strain cases, Airy's stress function – Polynomial stress functions. *Bending theory of beams- assumptions, bending stresses.* Bending of a cantilever beam subjected to end load and UDL, Sim ply supported beam subjected to UDL, Displacements in Cantilever and simply supported Beams.

Two dimensional problems in polar coordinates: Strain-displacement relations – Equations of equilibrium, Compatibility equation, Stress function.

15 Hours

UNIT – III

Axisymmetric Stress Distribution stress - strain relations for thin and thick cylinders, radial and circumferential stress distribution, Thick discs and

cylinders, Rotating discs.

Circular Hole in a plate- Effect on Stress Distribution subjected to Tension, compression and shear, Stress concentration factor.

10 Hours

Course Outcomes:

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

- 1. **Illustrate** mathematical representation of stresses, strains in continuum and **analyze** the beams for plane stress, plane strain conditions
- 2. **Formulate** compatibility equation in terms of strains and **measure** the strains in strain rosettes.
- 3. **Develop** the differential equations and **Solve** two dimensional problems in rectangular coordinates
- 4. **Develop** the differential equations and **Solve** two dimensional problems in polar coordinates.
- Determine the stress distribution under axisymmetric loading in cylinders, rotating discs and **analyze** the effect of circular hole in a plate

Mapping of POs & COs:

riup	Jilly		030		3.										
со	P01	PO2	PO3	P04	P05	P06	P07	P08	PO9	P010	P011	P012	PSO1	PSO2	PSO3
C01	3	2		1			2						2	2	
CO2	2	2	2	1			2						2	2	
CO3	3	2	3	2			2						2	1	
CO4	3		2	2			2						2	1	
C05	2	2	2	2									2	2	
		~ ! !			-					· · ·					

Note: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

TEXTBOOKS:

- 1. Timoshenko S.P. and Goodier J.N. "Theory of Elasticity", International Student's Edition, Mc Graw Hill Book Co., Inc., New Delhi,2005.
- 2. Wang P.C., "Applied Elasticity", 2005.

REFERENCE BOOKS:

- 1. Valliappan C., (1981), "Continuum Mechanics Fundamentals", Oxford & IBH Publishing Co. Ltd, New Delhi.
- 2. Srinath L.S., (2009), "Advanced Mechanics of Solids", Tata Mc Graw Hill Publications Co. Ltd., New Delhi.
- 3. Venkataraman& Patel, "Structural Mechanics with introduction to Elasticity and Plasticity", Mc Graw Hill Book Inc., New York, 2009.
- 4. Dr. Sadhu Singh, 'Theory of Elasticity", Khanna Publishers, Delhi, 2009.
- 5. T. G. Seetharam & L. Govindaraju, "Applied Elasticity", Interline publishing.

STRUCTURAL DYNAMICS

Course Code	19CVE104	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to

- 1. **Comprehend** principles of vibration and elementary components of a vibratory system.
- 2. **Comprehend** the behaviour of engineering structures subjected to dynamic forces.
- 3. **Analyze** undamped and damped free vibration of a single degree of freedom system
- 4. **Analyze** undamped and damped forced vibration of a single degree of freedom system
- 5. **Analyze** MDOF systems.

UNIT – I

Introduction to Structural Dynamics: Laws of motion, D'Alembert's Principle, Stiffness of springs in series and parallel, Mass moment of inertia, Simple harmonic motion, Vibration – Types, Parts of a vibrating system, *Degrees of freedom, Fundamentals of free vibration*.

Free vibration: Undamped and damped (single degree of freedom system),Logarithmic decrement.15 Hours

UNIT – II

Forced Vibration: Undamped and damped (single degree of freedom system) – Steady state response, Dynamic magnification factor, response to harmonic loading, Rotational and reciprocating unbalance, Force transmissibility, Force transferred to foundation, *Forced vibration and its effect on machine foundation.*

15 Hours

UNIT – III

Multi Degree of Freedom (MDOF) Systems: Response to Free and forced vibration – natural frequencies, *determination of Eigen values and Eigen vectors* – Orthogonality principle, Shear buildings modeled as MDOF systems. Forced undamped and damped vibration of shear buildings – Modal superposition method.

Course Outcomes:

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

- 1. **Explain** the principles of vibration and elementary components of a vibratory system.
- 2. **Discuss** the behavior of engineering structures subjected to dynamic forces.
- 3. **Analyze** undamped and damped free vibration of a single degree of freedom system.
- 4. **Analyze** undamped and damped forced vibration of a single degree of freedom system.
- 5. **Analyze** the given MDOF system.

Mapping of POs & COs:

CO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2	PSO3
C01	3	2		1									2	2	
CO2	2	2		1									2	2	
CO3	3	2		2									2	1	
C04	3	2		2									2	1	
C05	3	3		3									2	2	

Note: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

TEXTBOOKS:

- 1. Mukhopadhya M. "Vibrations, Dynamics and Structural Systems" Oxford IBH Publications, 2000
- 2. Mario Paz. "Structural Dynamics" CBS Publishers, 2004

REFERENCE BOOKS:

- 1. Clough & Penzien. "Dynamics of Structures" McGraw Hill Publishers 2004
- 2. Anil K Chopra. "Dynamics of Structures" PHI Publishers 2006
- 3. 3. S. R. Damodarasamy and S. Kavitha, Basics of Structural Dynamics and Aseismic Design, PHI Learning Private Limited, New Delhi, latest print 2015.

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

Course Code	21CVE105	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to

- 1. **Summarize** the concept, materials and types of pre-stressing.
- 2. **Analyse** the section for flexure and losses of pre-stress in concrete under different loading condition.
- 3. **Explain** deflection and analyse pre-stressed concrete members.
- 4. **Analyse** the section for flexure, shear in reference with IS code recommendations
- 5. **Solve** the permissible stress, Pre-stressing force and Eccentricity in a pre-tensioned and post-tensioned section.

UNIT – I

MATERIALS: High strength concrete and steel, stress-Strain characteristics and properties, Pre-tensioning and Post-tensioning systems, Tensioning methods and End Anchorages.

Basic principles of prestressing: Fundamentals, Load Balancing, Stress Concepts, Centre of Thrust.

ANALYSIS OF SECTIONS FOR FLEXURE: Stresses in concrete due to prestress and loads, Cable Profiles.

LOSSES OF PRE-STRESS: pre-tensioning and post tensioning, determination of jacking force.

15 Hours

UNIT – II

DEFLECTIONS: Short term and long-term, Methods of reducing deflection, Deflection limits as per IS: 1343, elastic deflections under transfer loads and due to different cable profiles, effect of creep, load verses deflection curve.

LIMIT STATE OF COLLAPSE: Flexural and Shear strength of sections, IS Code recommendations, shear resistance of sections, shear reinforcement, limit state of serviceability – control of deflections and cracking.

UNIT – III

DESIGN OF BEAMS: pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, prestressing force and eccentricity.

9 Hours

Course Outcomes:

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

- 1. Summarize the concept, basic materials and types of pre-stressing systems.
- 2. Solve the stresses and losses in the pre-stressed members.
- 3. Explain Short-term and Long-term deflections and Evaluate the deflection under given loading condition
- 4. Analyze the section for flexure, shear under limit state of collapse and serviceability for pre-stressed concrete members.
- 5. Evaluate pre-tensioned and post tensioned beam components for permissible stress, Pre-stressing force and Eccentricity.

CO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	1												2		
C02	2		2										2		
CO3		3	2					2					2	2	
C04		3						2					2	2	
C05		2	2					2					2	2	
	1: SI	ight	(Low	ı)	2:	Мос	lerat	te (M (Hig	1ediu gh)	ım)		3:	Sub	stanti	al

Mapping of POs & COs:

TEXTBOOKS:

- 1. N. Krishna Raju, "Pre-stressed Concrete", 6th edition, Tata McGraw Hill Education (India) Pvt. Ltd, Chennai 2018.
- Praveen Nagarajan, "Pre-stressed Concrete Design", Pearson Education, 2013

REFERENCE BOOKS:

- 1. T.Y. Lin and Ned H. Burns, "Design of pre-stressed concrete structures", 3rd edition, John Wiley & Sons, New York, 2015.
- N.C. Sinha & S.K. Roy, "Fundamental of pre-stressed concrete", 2011, S. Chand Limited.
- 3. IS: 1343: 2012 "Pre-Stressed Concrete Code of practice (To be provided in the examination)
- 4. P. Dayarathnam, "Pre-stressed Concrete", 6th edition, Oxford and IBH Publishing Co, 2018.
- 5. N. Rajgopalan, "Pre-stressed Concrete", Alpha Science International, 2005.

NPTELONLINESOURCE:

https://nptel.ac.in/courses/105/106/105106117/ http://www.nptelvideos.in/2012/11/prestressed-concrete-structures.html

GROUND IMPROVEMENT TECHNIQUES

Course Code	21CVE301	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to

- **1.** Know the objectives of soil improvement, classification of ground improvement techniques and to select the best method or technique for the existing condition.
- **2.** Know 'Hydraulic modification', its aim, principle and techniques such as gravity drain, lowering of water table, multistage well point, vacuum dewatering etc.
- **3.** Define chemical modification, its aim, special effects, different methods or techniques.
- **4.** Have a clear knowledge regarding "Grouting", effects of grouting, Chemicals and materials used, types of grouting. Grouting procedure and applications of grouting.
- **5.** Know the concepts and use of recent methods in Soil reinforcement.

UNIT – I

GROUND IMPROVEMENT: Definition, Objectives of soil improvement. Classification of ground improvement techniques. *Factors to be considered in the selection of the best soil improvement* technique.

MECHANICAL MODIFICATION: Type of mechanical modification, compaction, Principle of modification for various types of soils. Effect of grain size distribution on compaction for various soil types like BC soil, lateritic soil, coarse-grained soil, micaceous soil. Effect of compaction on engineering behaviour like Compressibility, Swelling and Shrinkage, Permeability, relative density, liquefaction potential. *Field compaction - static, dynamic, impact and vibratory type*. Specification of compaction. Tolerance of compaction.

14 Hours

UNIT – II

HYDRAULIC MODIFICATION: Definition, aim, principle, techniques, gravity drain, lowering of water table, multistage well point, vacuum dewatering, design of dewatering system including pipe line *effects of dewatering*. Drainage of slopes, preloading, vertical drains, numerical problems on design of vertical drains, sand drains, Prefabricated vertical drains sand drains, Electro osmotictic dewatering.

CHEMICAL MODIFICATION: Definition, aim, special effects, and methods, Techniques - sandwich technique, admixtures, cement stabilization. Hydration - effect of cement stabilization on permeability, Swelling and shrinkage. *Criteria for Lime stabilization, cement stabilization.* - *Suitability, process, special effects, criteria.* Other chemicals, chlorides, hydroxides, lignin, hydrofluoric acid. Fly ash in cement stabilization, Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.

15 Hours

UNIT – III

GROUTING: Introduction, Effects of grouting, Chemicals and materials used, Types of grouting, Grouting procedure and Applications of grouting.

MISCELLANEOUS METHODS (only Concepts): Introduction, Soil reinforcement. Thermal methods, Ground improvement by confinement - Crib walls, Gabions &Mattresses, Anchors, Rock bolts and soil nailing Geosynthetics in soil modification, Micro piles. Case studies.

Course Outcomes:

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

- 1. **Understand** the objectives, necessity and scope of ground improvement techniques
- 2. **Identify** and Implement the various methods of mechanical modifications in the soil improving techniques.
- 3. **Explain** the methods involved in ground modification by hydraulic methods.
- 4. **Identify** and apply the chemical modifications techniques in field conditions.
- 5. **Explain** techniques related to grouting and other miscellaneous soil reinforcement techniques.

		<u>.</u>													
СО	P01	PO2	PO3	P04	P05	P06	P07	P08	PO9	PO10	P011	P012	PSO1	PSO2	PSO3
C01	1	1			1							1	2	2	
CO2	1	2	Ì		1		1					1	2	2	
CO3	1	2	Ì		2	1	1					1	2	2	
CO4	1	2			2	1	1					1	2	2	
CO5	1	2			2	1	1					1	2	2	

Mapping of POs &COs:

Note: 1: Low 2: Medium 3: High

TEXTBOOKS:

- 1) Koerner. R.M. "Construction and Geotechnical Methods in Foundation Engineering", Prentice Hall, New Jersy, 3rd Edn. 2002.
- 2) Purushoptham Raj., P. "Ground Improvement Techniques" Tata McGraw Hill, New Delhi, 2005.

REFERENCE BOOKS:

- 1. Manfred Hausmann., "Engineering Principles of Ground modification". McGraw-Hill Ryerson, Limited, 1990
- 2. Colin, J.F.P. (1988) "Earth Reinforcement and Soil Structures".
- 3. Ingles, C.G. and Metcalf, J.B. (1956), Soil Stabilization- Principle and Practice.
- 4. Jewell, R.A., Soil Reinforcement with Geotextile, CIRIA, London, 1996.

INTERNET SOURCES:

- 1. https://nptel.ac.in/courses/105/108/105108075/
- 2. http://www.cdeep.iitb.ac.in/webpage_data/nptel/civil%20engineering/foundation_en gineering/course_home36.1.html

TRAFFIC ENGINEERING

Course Code	21CVE302	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

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

- 1. Understand the fundamentals of traffic engineering, scope and its uses in the actual field condition.
- 2. Understand the significance of various traffic studies as per IRC guidelines.
- 3. Understand the flow theories and its probabilistic approach in connection with traffic engineering.
- 4. Acquire the knowledge of traffic signals design and other traffic regulatory methods as per IRC.
- 5. Impart the basic knowledge on traffic rotary, street lighting, arboriculture and intelligent transport system.

UNIT - I

Introduction to Traffic Engineering: *Scope*, road user and vehicle characteristics- static and dynamic, *reaction time of driver*.

Traffic parameter Studies and Analysis: *Objectives*, method of studydefinition, data collection and analysis(traffic volume, spot speed, origin and destination, speed and delay), parking- on street and off street parking, accidents- *causes*, analysis and *measures*.

16 Hours

UNIT – II

Traffic Flow Theories: Green shield theory, Goodness of fit-correlation and regression analysis (linear only), Queuing theory, car following theory, Traffic forecast- simulation technique.

Traffic Regulation and Control: *Controls-Driver, Vehicle and Road*, Traffic Regulations- One Way Streets, *Traffic Signs, Road Markings*, Traffic signals-types, design principles (Webster's and IRC Method).

15 Hours

UNIT – III

ROAD INTERSECTIONS AND MANAGEMENT: Road intersection-Importance, classification, Rotary design, *Highway lighting, Road side Arboriculture*, Intelligent Transport system.

Course Outcomes:

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

- 1. Explain the Scope and characteristics of traffic engineering.
- 2. Illustrate the importance and methods in Traffic studies.
- 3. Summarize the Traffic flow theories and explain the importance.
- 4. Apply the design principles of traffic signals and outline the traffic regulation measures.
- 5. Design the rotary intersection and explain the importance of highway lighting, arboriculture and ITS.

Course Articulation Matrix:

CO	P01	P02	P03	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PSO1	PSO2	PSO3
C01	2	1				1	1						2	1	
C02	2	3	2			1	1						3	2	
CO3	3	2				1	1		Ì				2	1	
C04	2	2	3			1	1						2	2	1
C05	3	2	3			1	1						2	2	2

Note: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

TEXTBOOKS:

- Khanna S.K, C.E.G Justo & Veeraraghavan A. "Highway Engineering", Nemchand & Bros, Roorkee. (2014) (10th Revised Edition)
- 2. Kadiyali, L. R., "Traffic Engineering and Transportation Planning", 7th Ed., Khanna publishers, India (2012).

REFERENCE BOOKS:

- 1. Sharma S K," Principles, Practice and Design of Highway Engineering", S Chand and Company Ltd., New Delhi, 3rd Revised Edition. (2015).
- Kadiyali L. R., Lal. N.B, "Principles and Practices in Highway Engineering", Khanna Publishers, New Delhi. 7th Revised Edition. (2013).
- 3. Fred L. Mannering, Scott S. Washburn and Walter P. Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt Ltd, New Delhi. (2011)
- 4. Relevant IRC codes published by Bureau of Indian Standards, New Delhi.
- 5. Handbook for Roads and bridges MORTH, New Delhi.(2009)

NPTEL SOURCES:

https://nptel.ac.in/courses/105/105/105105107/

HIGHWAY GEOMETRIC DESIGN

Course Code	21CVE303	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

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

1. Understand the different road design elements factors as per IRC Standards.

2. Acquire the knowledge in different cross-sectional elements of highway.

3. Understand and calculate the different sight distances, set back distance.

4. Understand the elements and calculate the length of horizontal and vertical alignment.

5. Identify different intersection and design the traffic rotary intersections and drainage systems.

UNIT – I

INTRODUCTION: *Objectives, requirements,* design control factors: topography, design speed, design vehicle, traffic capacity, volume, environment and other factors - IRC specifications, PCU concept for design.

CROSS SECTION ELEMENTS: Pavement surface characteristics – friction, skid resistance, pavement unevenness, light reflecting characteristics, camber: *objectives*, types, methods, pavement width carriageway, kerb, medians, shoulders, foot paths, parking lanes, service roads, cycle tracks, driveways, *guard rails, width of formation, right of way*, design of road humps as per IRC Specification. **15 Hours**

UNIT – II

SIGHT DISTANCES: Factors and problems: stopping and overtaking, at intersections, set back distances at curves.

HORIZONTAL AND VERTICAL ALIGNMENT: Horizontal alignment: *objectives, requirements,* design elements, super elevation, extra widening of pavements at curves, transition curve: types, evaluating length; vertical alignment: *gradient,* design criteria, types, design of summit and valley curves, design standards for hill roads.

15 Hours

UNIT – III

INTERSECTION DESIGN: *Types*, elements, design considerations of atgrade intersection, grade separations and interchanges, rotary and its design only.

HIGHWAY DRAINAGE: *Importance, Requirements of surface and subsurface drainage*, design of cross sections and filter material.
Course Outcomes:

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

- 1. Explain the road design control factors as per IRC guidelines.
- 2. Explain the road surface characteristics, road side amenities and illustrate the design aspects of road hump as per IRC guidelines.
- 3. Determine the sight distances and set back distance at highway curves.
- 4. Design the horizontal, vertical alignment elements in highway and hill roads.
- 5. Illustrate the types of intersection, highway drainages and design traffic rotary, highway drainage cross section and filter material.

Mapping of POs & COs:

СО	P01	P02	P03	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PSO1	PSO2	PSO3
C01	2	2	2										1	1	1
CO2	2	2	2										1	2	1
CO3	3	2	3										2	3	2
C04	3	2	2										1	2	2
CO5	3	3	3										2	3	3

Note: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

TEXTBOOKS:

- 1. Khanna S.K, C.E.G Justo & Veeraraghavan A. "Highway Engineering", Nemchand & Bros , Roorkee.(2014) (10th Revised Edition)
- Kadiyali L. R., Lal. N.B, "Principles and Practices in Highway Engineering", Khanna Publishers, New Delhi. 7th Revised Edition. (2013).

REFERENCE BOOKS:

- 1. Sharma S K," Principles, Practice and Design of Highway Engineering", S Chand and Company Ltd., New Delhi, 3rd Revised Edition. (2015).
- 2. Kadiyali, L. R., "Traffic Engineering and Transportation Planning", 7th Ed., Khanna publishers, India (2011).
- 3. Relevant IRC codes published by Bureau of Indian Standards, New Delhi.
- 4. Handbook for Roads and bridges MORTH, New Delhi.(2001)

NPTEL ONLINE SOURCES:

• https://nptel.ac.in/courses/105/105/105105107/

EARTH RETAINING STRUCTURES

Course Code	21CVE304	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to

- 1. Know about types of retaining wall, forces acting on them and possible modes of failure of each type.
- 2. Understand how to analyze stability of different types of retaining wall, and to study different types of sheet pile walls and how to design them under different soil conditions.
- 3. Differentiate between cantilever sheet pile wall and anchored sheet pile wall with reference to the design and construction for given field conditions.
- 4. Study and understand lateral earth pressure distribution on sheeting of braced system in different soil types.
- 5. Study different components of braced systems, their selection and design them for given soil and depth of excavation. Also, to study the different types of coffer dams and the usefulness under the different situations.

UNIT – I

RETAINING WALLS: Types of retaining wall and forces on each type of wall. Modes of failure of retaining walls - sliding, overturning and bearing. Stability analysis and principles of the design of retaining walls – Gravity retaining walls, *Cantilever retaining walls, counter fort retaining walls (no structural design)*. Drainage from the backfill.

BULK HEADS: Cantilever sheet pile walls *Types of sheet pile walls.* Cantilever sheet pile wall in cohesion-less soils. Cantilever sheet pile wall in clay. Design problem in each case.

16 Hours

UNIT –II

BULK HEADS: Anchored Sheet Pile Walls:

Anchored sheet pile with free earth support in cohesion-less and cohesive soil. Bulkheads with fixed earth support method – *Types, locations and design of anchors*.

BRACED CUTS: Introduction. Lateral earth pressure on sheeting, Different types of sheeting and bracing systems. *Design of various components of bracings*.

15 Hours

UNIT – III

COFFER DAMS & CELLULAR COFFER DAMS: Introduction. Introduction – *types of cofferdams* - Design of cellular cofferdams on rock by Tennesse Valley Authority (TVA) method – safety against sliding, slipping, overturning, vertical shear and stability against bursting

Design of cellular coffer dam on soil -safety against sliding, slipping, overturning, vertical shear and stability against bursting.

Course Outcomes:

9 Hours

At the end of the course students will be able to

- 1. **Explain** and **analyze** retaining wall, the force acting on earth type wall and possible mode of failure of each type.
- 2. Explain and design cantilever type sheet pile wall.
- 3. **Explain** anchored sheet pile walls, its advantage over cantilever sheet pile wall.
- 4. **Analyze** and identify lateral earth pressure distribution on sheeting of braced system for earth trench in different soil types.
- 5. Analyze and design coffer dams and cellular cofferdams.

со	PO 1	РО 2	РО 3	РО 4	РО 5	РО 6	РО 7	РО 8	РО 9	PO1 0	PO1 1	PO1 2	PS0 1	PSO 2	PSO 3
CO 1	2	3	2										2	3	1
CO 2	2	2	3										2	3	1
CO 3	1	2	3										2	3	1
CO 4	1	2	3										2	3	1
CO 5	2	2	3										2	3	1

Mapping of POs & COs:

1: Low 2: Medium 3: High

TEXTBOOKS:

- Clayton, C.R.I., Woods, R.I., Bond, A.J., Milititsky, J. Earth Pressure and Earth-retaining structures, CRC Press, Taylor and Francis group, 2013
- 2. Budhu, M. Foundations and Earth retaining structures, John Wiley & Sons, Inc., 2008

REFERENCE BOOKS:

- 1. Bowles, J.E. Foundation Analysis and Design, 5th Edition, BBS Publisher, 2009.
- 2. Donald P Coduto Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.
- 3. Soil Mechanics and Foundation Engineering, Dr. K.R. Arora, (Sixth edition) (2003), Standard Publishers & Distributors.
- 4. Soil Mechanics and Foundation Engineering, S.K. Garg, (Fifth edition) (2004), Khanna Publishers.
- 5. Soil Mechanics and Foundation Engineering,: Dr. B.C. Punmia (2005), Laxmi Publications Ltd.,
- 6. Numericals in Geotechnical Engineering, A.V. Narasimha Rao & Dr. C. Venkataramaiah, University Press.
- 7. Soil Mechanics and Foundation Engineering, Dr. V.N.S. Murthy (2011), C B S Publishers and Distributers, Bengaluru.
- 8. Geotechnical Engineering, Dr. C. Venkataramaiah (2006), New Age publications.

NPTEL ONLINE SOURCES:

- 1. http://www.cdeep.iitb.ac.in/webpage_data/nptel/civil%20engineering/ foundation_engineering/toc-m6.html
- 2. http://nptel.ac.in/courses/105106052/9
- 3. http://nptel.ac.in/downloads/105101083/

ROAD SAFETY AND MANAGEMENT

Course Code	21CVE305	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives

This Course will enable students to

1. Get awareness about the global, national and regional road crash scenario and their impacts

- 2. Identify the risk factors associated with crash involvement and its severity
- 3. Demonstrate the traffic management measures to minimize road crash
- 4. Understand the methods of collection and analysis of crash data
- 5. Gain the knowledge of the procedure for performing road safety audit.

UNIT – I

INTRODUCTION TO ROAD SAFETY ENGINEERING -

Over view of road safety - Global road safety scenario and pattern - global

trends and projections - national and state road safety level - problems in road safety in developing countries magnitude, socioeconomic and health effects.

TRAFFIC ELEMENTS -

Characteristics of Road user, Motor vehicle, Roadway- relationship between elements- human factors governing road user behavior- risk factors for traffic accidents- exposure to risk- crash involvement- crash severity- post crash injury outcomes.

UNIT - II

ANALYSIS AND PREVENTION OF ACCIDENTS

Collection of accident data- Statistical methods for analysis of accident data-Speed in relation of safety- Weather and its effects on accidents- *Vulnerable road users safety- parking influence on accidents.*

TRAFFIC MANAGEMENT MEASURES FOR ACCIDENT PREVENTION

Legislation, Enforcement, Education and Propaganda, *Formulating and implementing road safety policy*.

14 Hours

17 Hours

UNIT – III

ROAD SAFETY IMPROVEMENT PROGRAM

Road safety audit (RSA) - Procedure in road safety audit- design standardsaudit tasks- stages of road safety audit- key legal aspects. *Road design issues in RSA*'s – *structuring and preparation of audit report.*

9 Hours

Course Outcomes:

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

- 1. **Identify** the factors contributing to accidents
- 2. **Collect** the necessary data pertaining to road crashes and **prepare** comprehensive accident crash database.
- 3. **Perform** the statistical analysis of accident crash data.
- 4. **Describe** the traffic management measures for accident prevention
- 5. **Explain** the road safety audit and **prepare** a detailed audit report.

TEXTBOOKS:

- 1. Kadiyali, L. R., "Traffic Engineering and Transportation Planning", 7th Ed., Khanna publishers, India (2011).
- 2. David L. Geotsc. Occupational Safety and Health for Technologists, Engineers and Managers. 5th Edition, 2004.

REFERENCE BOOKS:

- 1. World Health Organization, Road Traffic Injury Prevention Training Manual, 2006.
- 2. Fuller, R., Santos, J.A. Human Factors for Highway Engineers, Pergamon, 2002.
- 3. IRC: 103-1988, Guidelines for Pedestrian Facilities, Indian Roads Congress, New Delhi.
- 4. IRC: SP: 32-1988, Road Safety for Children (5-12 Years old), Indian Roads Congress, New Delhi.
- 5. IRC: SP: 44-1996, Highway Safety Code, Indian Roads Congress, New Delhi.
- 6. IRC: SP: 88-2010, Road Safety Audit Manual, Indian Roads Congress, New Delhi.
- Khanna. S. K, Justo. C.E.G, Veeraragavan. A, "Highway Engineering", Revised 10th edition, Nem Chand and Bros, 2014.
- 8. Sharma S K," Principles, Practice and Design of Highway Engineering", S Chand and Company Ltd., New Delhi, 3rd Revised Edition. (2015).

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со	P01	PO2	PO3	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PSO1	PSO2	PSO3
CO1	1	3											2	1	
CO2	3	1											1	2	2
CO3	3	2	2										2		
CO4	3	1												3	
CO5	2	3												2	

Course Articulation Matrix:

1: Low 2: Medium 3: High

ALTERNATIVE BUILDING MATERIALS & TECHNOLOGIES

Course Code	21CVE501	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to

- 1. **Learn** the energy consumption in building materials and cost effective technologies in buildings.
- 2. **Illustrate** the design concept for green building taking into consideration of local climatic condition and building materials.
- 3. **Summarize** the alternative building materials in the present context from wastes.
- 4. **Summarize** the alternative building technologies which are followed in present construction.
- 5. **Outline** alternate roofing systems with respect to local climatic conditions and locally available building material

UNIT – I

INTRODUCTION

Energy in building materials, Environmental issues concerned to building materials, embodied energy calculations. Green design concepts in buildings and its rating, Rainwater harvesting. Environmental friendly and cost effective building technologies, Cost concepts in buildings, Cost saving techniques in planning, design and construction. *Comprehensive understanding, criterion, rating procedure of green building through GRIHA assessment.* **14 Hours**

UNIT – II

ALTERNATIVE BUILDING MATERIALS - Fiber reinforced concrete - Matrix materials, metal and synthetic fibers, Properties and applications. Ferrocement components, materials and specifications, properties and construction methods. Masonry blocks using industrial wastes, Raw materials, manufacture, properties, advantages and disadvantages of FaL G blocks and Stabilized mudblock.

Building materials from agro and industrial wastes Types of agro wastes, Types ofindustrial and mining wastes, properties and applications.15 Hours

UNIT – III

ALTERNATIVE BUILDING TECHNOLOGIES

Use of arches in foundation, alternatives for wall construction, composite masonry, confined masonry, cavity walls, rammed earth, applications, Top down construction.

Alternative roofing systems: concepts of filler slabs, composite beam panel roofs. Waffle slab construction. Bridge construction by balanced cantilever, incremental launching methods.

Mivan Construction Techniques, Precast concrete and modular construction methods.

10 Hours

Course Outcomes:

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

- Solve the problems related to Energy of building materials and make use of cost effective building technologies.
- 2) **Make use of** the design concept for green building taking into consideration of local climatic condition and building materials.
- 3) **Utilize** suitable agro and industrial wastes as a building material.
- 4) **Select** suitable type of alternative building technologies used in civil engineering construction.
- 5) **Make use of** the alternative economical roofing system by considering local climatic condition.

со	P01	PO2	PO3	P04	P05	P06	P07	P08	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	2														3
CO2	1														2
CO3	2	1											2		2
CO4	2	1											2	2	3
C05	2												2	2	3

Mapping of POs & COs:

Note: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

TEXTBOOKS:

- K.S Jagadish et al., "Alternative Building Materials and Technologies", New Age International Publishers – 1st edition -2007, Reprint: Aug – 2014
- Arnold W Hendry, "Structural Masonry", Macmillan Publishers 3rd Edition December 2013.

REFERENCE BOOKS:

- 1. IS: 15912 (first revision 2017) Structural Design Using Bamboo Code of Practice.
- 2. James J Marks, "The Alternative Building Source Book", Chelsea Green Publishers, 1st Edition 1998.
- Clarke Snell et al., "Building Green", Large Book Publishers, 1st edition in 2005, reprinted -2014.
- Jon Nunan, "The Complete Guide to Alternative Home Building Materials and Methods", Atlantic Publishing Company 30th October – 2009, Re-Print 2010.

ADVANCED CONCRETE TECHNOLOGY

Course Code	21CVE502	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives

This Course will enable students to:

- 1. Understand the importance of microstructure of cement and concrete, types of admixtures and its properties in fresh and hardened state of concrete.
- 2. Know the tests and factors affecting the results of hardened concrete.
- 3. Understand durability requirements.
- 4. Select a suitable type of concrete based on specific application.
- 5. Know the design concepts cement concrete by BIS method.

UNIT - I

INTRODUCTION: Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, Transition Zone, transport through cement microstructure. Rheology of concrete.

TESTS ON HARDENED CONCRETE: Elastic Modulus, factors affecting strength and elasticity of concrete, Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition. Determination of hardened concrete original W/C. NDT test concepts - Rebound hammer,

Ultrasonic Pulse Velocity (UPV) methods.

16 Hours

UNIT – II

DURABILITY OF CONCRETE -

Effect of fire, aggregates, abrasion and cavitation. Autogenious, drying and plastic cracking in concrete.

Corrosion of steel reinforcement, carbonation, chloride ingress, corrosion of prestressing steel. Sulphate attack and delayed ettringite formation, physical salt attack.

SPECIAL CONCRETES

Concept, materials, properties and applications of Alkali Activated Binders, Graphic concrete pattern for precast concrete surface, Self-healing concrete, Pollution Eating Concrete, Engineered Cementitios Composites, Bio Receptive Concrete to colonize structural concrete, Living 'concrete' to reduce the environmental impact, High quality Graphene concrete, Cement made with CARROT extract.

15 Hours

UNIT – III

MIX DESIGN - Factors affecting mix design, Design of High Strength Concrete mixes with/without mineral admixtures using IS 10262-2019 method.

8 Hours

Course Outcomes:

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

- 1. **Explain** the microstructure of HCP, mechanism of Water Reducing Agents, Bingham's parameters, elasticity of concrete, **calculate** the effect of chemical composition changes on Bogue's compounds formation and effect of w/c on Volume and porosity.
- 2. **Explain** the effect of admixtures on fresh and hardened concrete properties, **compare** the effects of test conditions on concrete strength.
- 3. **Explain** the durability of concrete and **identify** the remedial measures for the durability related issues.
- 4. **Explain** the concept, materials, properties, applications, manufacturing method and typical mix of special concretes.
- 5. **Design** High Strength Concrete mix proportioning with/without mineral admixtures, as per IS 10262-2019.

Course Articulation Matrix:

CO	P01	P02	P03	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PSO1	PSO2	PSO3
C01	3	1											1	2	
C02	2	1					1						1	2	2
CO3	2	1	1			1							1	2	1
C04	2	1					1						2	2	2
C05	3	2	3			1	1	2					2	3	2

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

TEXTBOOKS:

- Neville, A.M., "Properties of Concrete", ELBS Edition, Longman Ltd., London. 2015.
- 2. M.S. Shetty, (2015) "Concrete Technology Theory and Practice" S. chand and company New Delhi.
- 3. P.K. Mehta, P J M Monteiro, (2016) "**Concrete microstructure and properties",** Prentice Hall, New Jersey (Special Student Edition by Indian Concrete Institute, Chennai).

REFERENCE BOOKS:

- 1. IS 10262-2019 "Concrete mix proportioning guidelines".
- 2. N. Krishna Raju, "Concrete Mix Design", Sehgal Publishers, 2016
- 3. Gambhir M.L, "Concrete Manual", Dhanpat Rai & Sons, New Delhi, 2012

NPTEL:

https://nptel.ac.in/courses/105/106/105106176/

BUILDING SERVICES

Course Code	21CVE503	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students

- 1. To gain the knowledge of different building services and their types used in buildings.
- 2. To understand the functional requirements of ventilation and principles of illumination of buildings.
- 3. To outline the classification of air conditioning based on function and season.
- 4. To gain knowledge of different thermal properties and insulation materials for buildings.
- 5. To explain the fire hazards and general safety requirements for buildings.

UNIT – I

Introduction: requirements and necessity of services for buildings. Types.

Ventilation: Definition, Necessity, Functional Requirements, Types- Natural Ventilation and Artificial Ventilation

Illumination of buildings- definition, laws of illumination, principles, artificial lighting, day lighting, flood lighting, Introduction to various types of lamps.

15 Hours

UNIT – II

Air conditioning of buildings- essentials of air-conditioning systems, classification based on function & season, systems, design- AC load calculations, installation and maintenance cost.

Thermal comfort in buildings- factors affecting, heat transfer through buildings, thermal properties of building materials, insulation materials for buildings.

15 Hours

UNIT – III

Fire protection: necessity, fire hazards, characteristics and types of fireresistant materials, fire load and its calculation, fire resistant construction – walls and columns, floors and roofs, wall openings, escape elements and strong room construction, fire protection equipment. General fire safety requirements.

9 Hours

Course Out comes:

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

- 1) **Explain** the different building services and their types used in buildings.
- 2) **Summarize** the functional requirements of ventilation and principles of illumination of buildings.
- 3) **Classify** the air conditioning based on function and season.
- 4) **Explain** thermal properties and insulation materials for buildings.
- 5) **Explain** the fire hazards, **assess** fire load and **summarize** the general safety requirements for buildings.

CO	P01	PO2	PO3	P04	P05	P06	P07	P08	PO9	P010	P011	P012	PSO1	PSO2	PSO3
C01	2											2	2	2	2
C02	2					2						2	1	2	
CO3	2					2						2	1	2	
C04	2														
C05	CO5 2 2 2 2 2 1 2														
	1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)								n)	3:	Subs	al			

Mapping of POs & COs:

TEXTBOOKS:

- 1. Building construction by B.C.Punmia, Laxmi Publications.
- 2. A Text Book on Building Construction by P.C.Varghese, Prentice Hall of India publications
- 3. Architectural Lighting by Bran David.

REFERENCE BOOK:

1. IS SP41and SP32-hand book on functional requirements of buildings

CONSTRUCTION PLANNING AND CONTROL

Course Code	21CVE504	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

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

- 1. Illustrate concepts related to management, economics and project feasibility conditions.
- 2. Outline the principles and concepts involved in management.
- 3. Illustrate the needs of planning and updating project schedule through project management tools such as CPM, PERT.
- 4. Identify suitable database to manage and organize information's in project.
- 5. Solve problems using optimization techniques.

UNIT – I

ENGINEERING ECONOMICS- Basic Concepts of economic analysis, Micro and Macro analysis, project feasibility, benefit cost ratio, interest formula, present worth, future worth, Annual equivalent, Basis for comparison of alternatives, break even analysis. Introduction to management, organization and administration.

Value engineering, time management, labor and Material management.

13 Hours

UNIT – II

CONSTRUCTION PLANNING - Introduction, time estimates, planning methods of projects, Bar and Milestone charts, PERT and CPM network analysis, crashing of networks. Project Information and its accuracy, use of Information, organizing information in databases, Relational and conceptual model of databases, Centralized database management Systems, Programs, Information Transfer and Flow.

Computerized Organization and use of Information.

13 Hours

UNIT – III

OPTIMIZATION TECHNIQUES: Linear Programming: standard form of linear programming, formulation, solution to LPP by graphical method.

Transportation Problem: Introduction, mathematical formulation, methods for initial basic feasible solution, North West corner method, Vogels Approximation method.

Transportation Problem: least cost method, Row and Column minima method. 13 Hours

Course Outcomes:

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

- 1. **Make use of** concepts related to management and economics for project feasibility.
- 2. **Relate** effectively the principles and concepts involved in management of civil works.
- 3. **Utilize** project management tools to develop plan and schedule.
- 4. **Identify** and **choose** database systems to manage and organize systems.
- 5. **Utilize** the linear programming and transportation problems for solutions.

Mapping of POs & COs:

со	P01	P02	PO3	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PS01	PSO2	PSO3
CO1	2														3
CO2		1									1				
CO3	2										2		2		3
CO4	2	1									1				
CO5	2										2				3

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

TEXTBOOKS:

- 1. K. Subramanyam, "Construction Management", Anuradha Publishers Madras, (2009).
- 2. L.S. Srinath, "Pert and CPM". Affiliated East-West Press Pvt. Ltd. New Delhi. (2014).
- 3. B.C Punmia, "Pert and CPM", Lakshmi publication (2016).
- 4. Peurifoy , R.L , "Construction Planning equipments and methods", 8th edition, Mc Graw Hill Publication (2010).

REFERENCE BOOKS:

- 1. Mahesh Varma, "Construction planning and management", Metropolitan Book Co, Delhi.
- 2. S.D. Sharma, "Operation research". 4th edition, Pub: KedarnathRamnath, Meerut, Delhi (2015).

CONSTRUCTION QUALITY MANAGEMENT

Course Code	21CVE505	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to

- 1) Summarize the history and quality elements in engineering management.
- 2) Explain the Integrated quality management as per International Organisations for Standardization.
- 3) Utilize the quality control in construction projects.
- 4) Summarize the process and steps involved in benchmarking process.
- 5) Outline the quality management system in construction projects.

UNIT – I

Quality –History, definition, inspection, control, assurance, engineering, management, Quality guru's, quality function deployment, *six sigma methodology – leadership principles, six sigma team.*

Integrated Quality Management – quality standards, International Organisations for standardization (ISO), ISO 9000 Quality Management system, ISO Certification, ISO 14000 Environmental Management System, *Occupational Health and safety assessment series.*

15 Hours

UNIT – II

QUALITY CONTROL IN CONSTRUCTION PROJECTS QC in concreting, Brick work, stone masonry, Formwork, Foundations, Piling work, Structural work, Woodwork & Timber, Painting, Electrical system, *Waste recovery and maintenance.*

BENCH MARKING: Sources, Process & Step model for Benchmarking, Types of Benchmarking and Code of Conduct. *Internal & External Benchmarking, Advantages of Benchmarking.*

15 Hours

UNIT – III

QUALITY MANAGEMENT SYSTEM IN CONSTRUCTION PROJECTS: Concept, Approach to Problems, Quality Assurance, Quality Control, *Quality Inspection, Records and Reports, Training*, Total Quality Control, Manual/Check Lists, Guide Lines.

10 Hours

Course Out comes:

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

- 1) **Explain** the history, quality elements and **summarize** the six-sigma methodology.
- 2) **Summarize** the Integrated quality management as per International Organisations for Standardization.
- 3) **Explain** the quality control carried in the construction projects.
- 4) **Explain** the process and steps involved in benchmarking process.
- 5) **Explain** the quality management system in construction projects.

Mapping of POs & COs:

CO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	2					2						2	1		
C02	2					2		3				2	1		
CO3	2					2						2	2	2	3
C04	2					2						2	2	2	1
C05	CO5 2 2 2 2 2 2									1					
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)								al							

TEXTBOOKS:

- 1. Total Quality Management for Engineers by Mohammed Zairi, Aditya Books Pvt. Ltd., New Delhi. 1992.
- 2. Project Planning and Control with PERT and CPM by B.C. Punmia and K.K. Khandelwal, Lakshmi Publications Pvt. Ltd., New Delhi.
- 3. Total Quality Management by B. Janakiraman and R.K. Goapal, Prentice-Hall of India Private Limited, New Delhi.

REFERENCE BOOKS

- 1. Quality in the Construction Project by Fox, Arthur J., and Holly A. Cornell, American Society of Civil Engineers, New York, Latest Edition.
- 2. Total Quality Management by Mohantry R.P. and Lakhe R.R., Jaico Publishing House, Mumbai, 2000.
- 3. Total Quality Management by Break Joseph and Susan Joseph, Excel Books, New Delhi, 1995.
- 4. Total Quality in Construction Projects by Hellard R.B.: Achieving profitability with customer satisfaction, Thomas Telford, London, 1993.
- 5. Quality Management by Manjual, Satish, Raj Publishing House, Jaipur, 1999.

CONSTRUCTION METHODS AND EQUIPMENT

Course Code	21CVE506	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to

- 1. Summarize the construction of equipment planning, cost of owning and operating.
- 2. Explain the types and specifications of compacting equipment's.
- 3. Outline the fundamentals and preliminary earth work operations.
- 4. Explain the types, basic parts and operating procedure of earthwork equipment's.
- 5. Outline the process of foundation grouting.

UNIT – I

Construction planning, types, importance, lack of planning. Equipment management in projects, classification of equipment's, selection of construction equipment's, cost of owning and operating, economic life of equipment's, cost control of equipment's, depreciation analysis.

Equipment for Compaction – Introduction, specification and types of compacting equipment's.

15 Hours

UNIT – II

Equipment for Earthwork - Fundamentals of Earth Work Operations, types of Earth Work, Machines for preliminary work.

Tractors – Basic parts and operation, Scrapers – types, construction, operation and applications, Motor Graders – construction, operation and safety, Dragline – types, basic parts and operation. Clamshells – Classification, Hoe – basic parts, operation and application, Bulldozer – Classification, selection of type of bulldozer and out of bulldozer. Power Shovel – types, basic parts, operation of shovel, selection of type, size of power shovel and factors affecting the output of power shovel, methods of improving the output of power shovel.

15 Hours

UNIT – III

Foundation grouting – materials, purpose, exploring the need, *rate of grouting, equipment's of cement grouting and effectiveness.*

10 Hours

Course Out comes:

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

- 1) **Explain** the planning of construction equipment and **solve** for the owning, operating and depreciation cost.
- 2) **Summarize** the types and specifications of compacting equipment's.
- 3) **Explain** the fundamentals and preliminary earthwork operations.
- 4) **Explain** the types, basic parts and operating procedure of earthwork equipment's and **calculate** the output of a power shovel.
- 5) **Summarize** the process of foundation grouting.

СО	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	2	2		3				2					2	2	2
C02	2												1	2	
CO3	2												1	2	
C04	2	2		3		2							2	2	
C05	CO5 2 1 1 1								2						
	1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)									al					

Mapping of POs & COs:

TEXTBOOKS:

- 1. B. Satyanarayana and S. C. Saxena, "Construction, Planning and Equipment's", Standard Publishers New Delhi, 8th edition, 2019.
- Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction. Planning, Equipment and Methods", 9th Edition, McGraw Hill, Singapore, 2019.

REFERENCE BOOKS:

- 1. Sharma S.C. "Construction Equipment and Management", Khanna Publishers, New Delhi, 2017
- 2. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 1988.
- 3. Dr. Mahesh Varma, Construction Equipment and its planning and Application, Metropolitan Book Company, New Delhi, 1983.

GROUND WATER HYDROLOGY & EXPLORATION

Course Code	21CVE701	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable the students to:

- 1. **Develop** an understanding on the fundamentals of groundwater hydrology, **appraise** its Significance and **Inspect** the techniques of groundwater exploration, development and management.
- 2. **Explain** the occurrence and distribution of subsurface water, **list** and **distinguish** the types of aquifers, wells and their characteristic properties.
- 3. **Explain** aquifer parameters, **analyze** pump test and Darcy' Law governing the steady unidirectional groundwater flow.
- 4. **Explain** Well hydraulics and **estimate** the aquifer parameters in steady and unsteady state radial flow into unconfined and confined aquifers.

UNIT – I

INTRODUCTION: Vertical distribution of subsurface water and its occurrence. Aquifer and its types, water bearing properties of rocks and their classification.

FUNDAMENTALS OF GROUND WATER FLOW: Aquifer parametersporosity, permeability, Specific yield, specific retention, hydraulic conductivity, storage coefficient, transmissibility, Pump tests, recuperation tests, interference of wells; Darcy's law, steady unidirectional flow in confined and unconfined aquifers.

16 Hours

UNIT – II

WELL HYDRAULLCS:

Steady state Radial flow in confined and unconfined aquifer, Thiem's equilibrium formulae; Estimation of Discharge and Transmissivity.

Unsteady state Radial flow: Aquifer parameters, General equation derivation- Theis's method, Cooper-Jacob method, Chow's method, solution of unsteady flow equations.

15 Hours

UNIT – III

GROUNDWATER EXPLORATION, DEVELOPMENT AND MANAGEMENT:

Remote sensing and Geophysical methods, Electrical Resistivity methods, types of wells and yield of a well. Methods of construction, tube well design, dug wells, well development, pumps for lifting water - working principles, power requirement. Resource Management, Conjunctive use - necessity, techniques and economics.

8 Hours

Course Outcomes:

At the end of the Course students will be able to

- **1. Illustrate** the vertical distribution and occurrence of subsurface water, **List** and **distinguish** the water bearing properties of the rocks, the types of aquifers and their characteristic properties
- **2.** List and explain aquifer parameters, analyze pump test and Darcy' Law in steady state unidirectional groundwater flow.
- **3. Explain** equilibrium Well hydraulics and **estimate** the aquifer parameters in steady state radial flow in the unconfined and confined aquifers
- **4. Explain** in-equilibrium Well hydraulics and **estimate** the aquifer parameters in unsteady state radial flow in the unconfined and confined aquifers using appropriate methods.
- **5.** List and categorize types of wells, inspect and explain advanced techniques of groundwater exploration, development and management using remote sensing, geophysics and GIS.

Course Articulation Matrix:

CO	P01	P02	P03	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PSO1	PSO2	PSO3
C01	2	2											1		
CO2	3	2				2							2		
CO3	2	3	Ì			2							2		
CO4	2	3				2							2		
CO5	3	2				2	2						2	2	
Note	e: 1:	Low				2: M	lediu	m			3: F	ligh			

TEXTBOOKS:

1. Todd, D. K., (2006) "Groundwater Hydrology", John Wiley and Sons, Singapore

2. Ramakrishnan, S. (2011) "**Ground Water**", 2nd edition, Scitech publications (India) Pvt. Ltd., Chennai

3. Garg, S. K. (2010) "**Hydrology and Water Resources Engineering**" Khanna Publishers, New Delhi

REFERENCE BOOKS:

- 1. Karanth, K.R. (1987) "Groundwater Assessment, development and Management", Tata McGraw Hill
- 2. Raghunath, H.M., (2007) "Groundwater", New Age International Publishers, New Delhi
- 3. Patel, A.S., and Shah, D.L., (2008), "Water management" New Age International Publishers, New Delhi
- 4. Bower H., (1978), Groundwater Hydrology, McGraw Hill. .
- 5. Walton W.C., (1970), "**Groundwater Resource Evaluation**", Mc Graw Hill Publication, New Delhi.

Online reference:

http://nptel.ac.in/courses/105101010/38# https://nptel.ac.in/courses/105/103/105103026/ https://nptel.ac.in/courses/105/105/105105042/

ENVIRONMENTAL IMPACT ASSESSMENT FOR CIVIL ENGINEERING

Course Code	21CVE702	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	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.

15 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, Fault tree analysis, Consequence Analysis.

15 Hours

UNIT – III

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.

9 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:

со	РО 1	РО 2	РО 3	РО 4	РО 5	РО 6	РО 7	РО 8	РО 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
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	1	2:	Med	ium	3: 1	ligh		•	•	•	<u>.</u>	<u>.</u>	•

TEXTBOOKS:

- 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

REFERENCE BOOKS:

- 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

RURAL WATER SUPPLY AND SANITATION

Course Code	21CVE703	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to:

- 1. Understand importance of water, drinking water standards, water treatment methods and different types of rural water supply systems.
- 2. Learn different rural sanitation methods and its importance, rain water harvesting and its uses.
- 3. Create awareness on communicable diseases and its control measures.
- 4. Understand different methods of Refuse collection methods and its disposal.
- 5. Provide the knowledge on Milk sanitation, quality control of milk.

UNIT – I

Rural water supply - Introduction: Need for a protected water supply, investigation and selection of water sources, various techniques for rural water supply, protection of well waters, drinking water quality standards water treatment methods – disinfection, deflouridation, hardness and iron removal, ground water contamination and control

Note: 1: Low 2: Medium 3: High

Rural sanitation-Conservancy, public latrine, concept of Eco-sanitation, trenching and composting methods, Two pit latrines, aqua privy, W.C, septic tank, soak pit. Drainage Systems: Storm water and sullage disposal, rain water harvesting and uses.

UNIT – II

Communicable diseases- Terminology, water borne diseases, classifications, methods of communication, general methods of control. Disease vectors: House fly and mosquito – life cycle, diseases, transmission and control measures.

Refuse collection and disposal-Garbage, ash, rubbish, collection methods, transportation, disposal- salvaging, dumping, controlled tipping, incineration, composting, dung disposal-digester, biogas plant.

16 Hours

UNIT – III

Milk sanitation- Essentials, test for milk quality, pasteurization, quality control, cattle borne diseases, planning for a cow shed.

7 Hours

Course Outcomes:

Mapping of POs & COs:

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

- 1. **Identify** problems in rural water supply and monitor, quality and maintenance of rural water supply, **design** low cost water treatment system for rural areas.
- 2. **Explain** rural sanitation, management of grey, storm water and **recognize** types of waste water treatment systems.
- 3. **Outline** the safe disposal methods of solid wastes.
- 4. **Illustrate** types of diseases and preventive measures.
- **5. Ensure** quality of milk and preventive **measures** for cattle borne diseases.

СО	P01	P02	PO3	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PSO1	PSO2	PSO3
C01	1	2	2			1	2	1					1	2	2
CO2	2	2				1	2	1					1	2	
CO3	1	2				1	2	1					1	2	
CO4	2	2				1	2	1					1	2	
C05	1	2				1	2	1					1	2	

16 Hours

TEXTBOOKS:

- (a) Joseph A. Salvato (1992), "Environmental Engineering and Sanitation" Wiley publications.
- (b) E.W Steel (1979), "Water supply & Sanitary Engineering". McGraw-Hill publications.
- (c)Terence J. McGhee, E.W. Steel (1991), "Water Supply and Sewerage". McGraw-Hill publications.

REFERENCE BOOKS:

- Park and Park (2017) "Preventive & Social Medicine", McGraw-Hill, publications. 24th edition.
- 2. B.C Punmia & Ashok Jain. (2009) "Environmental Engineering-II", Lakshmi publications.
- 3. Cairncross, S. and Feachem, R. (2000) Environmental Health Engineering in the Tropics, John Wiley & Sons, 306 p.
- 4. Dangerfield, B. J. (1983)Water Supply and Sanitation in Developing Countries, The Institution of Water Engineers and Scientists, London, England.
- 5. McGhee, T. J. (1991) Water Supply and Sewerage, McGraw-Hill, 602 p.
- 6. Morgan, P. (1990) Rural Water Supplies and Sanitation, Macmillan Education Ltd, 358 p.
- Qasim S. R., Motley E. M., Zhu G., (2000) Water Works Engineering

 Planning, Design and Operation, Prentice-Hall PTR, Upper Saddle River, NJ 07458.
- 8. Wright, F.B., Rural Water Supply and Sanitation, E. Robert Krieger Publishing Company, Huntington, New York.
- 9. Winbald, U., and Simpson-Hebert, M., Ecological Sanitation, SEI, Stockholm, Sweden.
- 10. Kadlec R.H. and Wallace S.D., Treatment Wetlands, CRC Press, Boca Raton
- 11. Wastewater Engineering Treatment and Reuse, Metcalf and Eddy, Tata McGraw Hill

NPTEL SOURCES

https://nptel.ac.in/courses/105/104/105104102/

http://www.pbdwss.gov.in/dwss/left menu/major schemes projects.html https://www.classcentral.com/course/water-1364 https://www.classcentral.com/course/water-1364

https://www.classcentral.com/course/sanitation-2230

REMOTE SENSING & GIS APPLICATIONS IN WATER RESOURCES ENGINEERING

Course Code	21CVE704	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

The course will enable the students to:

- **1. Explain** the basic principles of Geoinformatics comprising Remote sensing, Photogrammetry, GPS, GNSS& GIS
- **2. Explain** the stages and techniques of photogrammetry, aerial photo interpretation, visual & digital image processing, enhancement and interpretation.
- **3. Explain** and **Appraise** GIS its components, data structures, process and operation, Map and its projections, components, preparation and overlays
- **4. List, Explain and appraise** the significance of GEOMATICS in various Water Resource Engineering practices

UNIT – I

Remote sensing and its principles: Physics of Remote sensing, EM spectrum, Blackbody concept, atmospheric windows, spectral response of common earth features.

Platforms & Sensors: Ground based, Air borne and Space borne platforms, Active and Passive Sensors, Photographic sensors, scanners, radiometers, RADAR and thermal infrared, hyper spectral remote sensing, Indian satellites and sensors: capabilities, data products

Photogrammetry: Basic principles of Aerial photography and Photogrammetry, Flight procedures, Aerial Photo Interpretation and Analysis techniques.

Satellite Image Interpretation and Analysis techniques: Visual & Digital Image interpretation, Interpretation elements, False Colour Composites (FCC).

16 Hours

UNIT – II

Digital Image Processing, Analysis and GIS: Digital image formats, preprocessing and processing (DIP), image restoration/enhancement procedures, information extraction, pattern recognition concepts, post processing procedures.

Geographic Information System -concept and spatial models: Fundamentals of GIS, spatial and non-spatial data, Vector and Raster GIS, GIS Hardware and software, GPS & GNSS, georeferencing, digitization, Thematic Maps, Overlay Analysis, Operation of GIS, Co-ordinate systems and map projections, Map scale, data display and cartography.

15 Hours

UNIT – III

RS & GIS Applications in Civil Engineering: Watershed characteristics, Soil moisture analysis, Water quality assessment and monitoring, flood mapping and monitoring, Village resource mapping, Smart City Development, Groundwater inventory, coastal environmental studies.

8 Hours

Course Outcomes:

At the end of the course, upon successful completion, each student will be able to:

- 1. **Define** and **explain** the principles of Remote Sensing, and **list** various types of platforms, sensors & resolutions in RS with a special reference to Indian satellites and data products.
- 2. **Explain** Photogrammetry, its basic principles, elements of photo interpretation and Visual& Digital Image interpretation techniques.
- 3. **Explain** different stages involved in Digital Image Processing, various image enhancement techniques, **list** and **classify** the digital image formats and the extracted information for various purposes.
- 4. **Explain** and **Appraise** GPS, GNSS & GIS their components, data structures, process and operation, Map and its projections, components, preparation and Overlays.
- 5. **List** the applications and **explain** the significance of geospatial technology or GEOMATICS (Photogrammetry, RS, GPS, GNSS & GIS) in various fields of Water Resource Engineering practices.

со	P01	PO2	PO3	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PS01	PSO2	PSO3
C01	2	2											2	2	
CO2	2	2				2	1						2	2	
CO3	2	2				2	1						2	2	
CO4	2	2				2	1						2	2	
CO5	2	2				2	1						2	2	
1/L: Slight (Low)										2/M:	Mod	erate	(Mec	lium)	

Mapping of POs & COs:

3/H: Substantial (High)

TEXTBOOKS:

- 1. Anji Reddy, M. (2012) **Text Book of Remote Sensing and Geographical Information Systems**, Fourth Edition, BS Publication, Hyderabad
- 2. Bhatta, Basudeva (2011) **Remote Sensing and GIS**, 2nd edition, Oxford University Press, New Delhi
- Lillesand, T.M., Kiefer, R.W and Chipman, J.W. (2015) Remote sensing and Image Interpretations, 7th edition, John Wiley and sons, New Delhi

REFERENCE BOOKS:

- 1. Anji Reddy, M. and Hari Shankar, Y. (2006) *Digital Image Processing,* BS Pub., Hyd.
- Bernhardsen, Tor (2002) Geographic Information Systems-3rd Ed., Wiley India, Delhi
- 3. Canada Centre for Remote Sensing (2011) *Fundamentals of Remote sensing-Tutorial*
- Chang, Kang-tsung (2008) Introduction to Geographic Information Systems 4th Ed.,

Tata McGraw Hill Publishing Company Limited, New Delhi

- 5. Korte, George B. (2001), *The GIS Book*, Onword Press, Thomson Learning Inc., USA
- 6. Kumar, S. (2008) **Basics of Remote sensing and GIS,** Laxmi Publications (P) Ltd., Delhi
- Longler, Paul A., Goodchild, Michael F., Maguire, David J., Rhind. David W., (2004), *Geographic Information Systems and Science* John Wiley & Sons Ltd., ESRI Press
- Sabins, F.L. (1997) *Remote Sensing: Principles and Interpretation,* 3rd edn. WH Freeman and Company, New York, 494p.

NPTEL SOURCES

- https://www.youtube.com/user/edusat2004
- https://eclass.iirs.gov.in/login

ADVANCED HYDRAULICS

Course Code	21CVE705	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to

- 1. **Illustrate** Chezy's and Manning's formulae and **determine** most economical channel section.
- 2. **Explain** specific energy and **compute** critical flow in non-prismatic channels
- 3. Derive dynamic equations of gradually varied flow and compute draw down and back water curves
- 4. **Make use** of hydraulic jump as energy dissipater
- 5. **Explain** pipe network analysis and **analyse** pressure distribution system.

UNIT – I

Open Channel Flow:

Kinds of open channel flow, channel geometry, types and regimes of flow Velocity distribution in open channel, Uniform Flow – features of uniform flow, Manning's and Chezy's formula- rigid and mobile boundary channels, determination of roughness coefficients

Determination of normal depth and velocity, most economical sections, nonerodible channels, Flow in a channel section with composite roughness, flow in close conduit with open channel flow, wide open channel, specific energy, critical flow and its computation in non-prismatic channels.

15 Hours

UNIT - II

Varied Flow:

Dynamic equations of gradually varied flow, assumptions and characteristics of flow profiles, classification of flow profile, draw down and back water curves(M1 and M2 type) profile determination, graphical integration, direct step and standard step method, numerical methods.

Hydraulic Jumps: momentum in open channel flow, specific force, derivation of conjugate depths, types, basic characteristics, length and location, jump as energy dissipation, control of jump, surges.

15 Hours

9 Hours

UNIT – III

PIPE NETWORK:

Water distribution, network analysis, analysis of pressure distribution systemequivalent pipe and Hardy cross method, software application.

Course Outcomes:

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

- 1. **Determine** most economical channel sections for rigid and mobile boundary channels applying Chezy's and Manning's formulae and **compute** critical flow in non-prismatic channels
- 2. Explain and compute specific energy in non-prismatic channels
- **3.** Develop dynamic equations of gradually varied flow, **classify** the flow profiles and **compute** length of draw down and back water curves
- **4. Develop** conjugate depth relationship and **make use of** hydraulic jump as energy dissipater.
- 5. Analyse pressure distribution system in pipe network

с о	РО 1	PO 2	Р О З	Р О 4	Р О 5	Р О 6	P 0 7	P 0 8	Р О 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
C 01	1	3											1	2	
C 02	1	3											1	2	
C 03	1	3											1	2	
C 04	1	3	1	1									1	3	
C 05	1	3	2		2								1	3	

Course Articulation Matrix:

Note: 1: Low 2: Medium 3: High

TEXTBOOKS:

- 1. Modi, P.N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard Book House, 22nd edition, 2019.
- Rangaraju K G, "Flow through open channel", McGraw Hill Publications, 2nd edition 2001.

REFERENCE BOOKS:

- 1. A. K. Jain., "Fluid Mechanics", Khanna Publishers, New Delhi. 8th edition, 1995.
- 2. V. T. Chow: "Open-channel hydraulics." McGraw Hill Publications ,2009
- K. Subramanya "Flow in open channels" Mc Graw Hill India, 4th edition 2015.
- 4. Santhosh Kumar Garg., Water Supply Engineering, Khanna Publishers, New Delhi, 33 Edition,2010

NPTEL ONLINE SOURCE:

http://nptel.ac.in/courses/105103021

http://nptel.ac.in/courses/105105201

3D BIM - AUTODESK REVIT									
Course Code	21CVE901	CIE Marks	50						
Teaching Hours/Week (L:T:P)	1:0:4	SEE Marks	50						
Total Hours 40 Credits									

Course Learning Objectives:

During the course students will be enable

- 1. To know the interface of the Revit world and create the model, views, structural items.
- 2. To add stairs, ramps, railings, floors and roofs in the model
- 3. To create the ceilings, interiors, dimensioning, annotating and working with revit edit tools.
- 4. To show the detailing of the model, creating specific views, area plans.
- 5. To complete the project by using Autodesk Revit tool

UNIT – I

The Autodesk Revit World - The Revit Interface, the Project Browser, File Types and Families.

Creating a model - Placing Walls, Using Reference Planes, Editing Wall Joins, Placing Doors and Windows.

Creating views –Creating levels, creating and modifying building sections, adding wall section, creating detail sections, creating callouts, creating and modifying a camera view, creating an elevation.

Structural items – Adding structural grids, structural columns, structural framing, foundation systems, structural footings.

Stairs, Ramps, and Railings – Creating stairs by using rise/run function, winding staircase, custom railing system, custom stairs, adding ramps.

Floors – Placing floor slab, building a floor by layers, splitting floor materials, pitching a floor to a floor drain, creating shaft openings.

Roofs – Placing roofs by footprint, creating a sloping roof, creating roof by extrusion, adding a roof dormer.

15 hours

UNIT – II

Ceilings and interiors – creating ceilings, ceiling openings and soffits, interior design, alternate floor materials

Working with the Revit tools – Basic edit, Array, mirror, align, split element.

Dimensioning and Annotating – Selecting and applying dimensioning, placing text and annotation.

Detailing – Working with line weights, drafting on top of the detail, adding notes, creating blank drafting views.

Creating specific views and match lines – Duplicating views, creating dependent views, adding match lines.

Creating sheets and printing, creating rooms and area plans.

15 hours

UNIT – III

Project based learning

Create a building model of dimension $50' \times 80'$. Should include the following features; Plan, Elevation, Section details, Electrical layout, plumbing layout,

landscaping, 3D views.

Course Outcomes:

At the end of the course the students should be able to

- 1. To *illustrate* the interface of the Revit world and create the *model*, views, structural items. (L3)
- 2. *Model* stairs, ramps, railings, floors and roofs. (L3)
- 3. *Create* the ceilings, interiors, dimensioning, annotating and working with revit edit tools. (L3)
- 4. *Model,* show the detailing of the *plan* by creating specific views and represent the area plans. (L3)
- 5. Create the project by using Autodesk Revit tool (L6)

<u>Map</u>	pin	g of	POs	& C	<u> 0s:</u>		
0	P01	PO2	PO3	P04	P05	P06	PC

СО	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	2	2	2		2				2	2		2	2	2	
C02	2	2			2				2	2		2	2	2	
CO3	2	2			2				2	2		2	2	2	
C04	2	2			2			2	2	2		2	2	2	2
C05	2	2	2		2			2	2	2		2	2	2	2
	Sligh	2:	2: Moderate (Medium) 3: Substa						stanti	al					

(High)

REFERENCES

- 1. Eric Wing, "Autodesk Revit 2017 for Architecture No experience required", Autodesk authorized publisher.
- 2. "Autodesk[®] Revit[®]2015 Getting Started Guide", Autodesk authorized publisher.
- 3. "Revit shortcuts guide", Autodesk authorized publisher.

9 hours

CAD IN CIVIL ENGINEERING

Course Code	21CVE902	CIE Marks	50
Teaching Hours/Week (L:T:P)	1:0:4	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives

This Course will enable students to

- **1. Understand** the analysis by software tool.
- 2. **Identify** different types of methods of analysis using software's
- 3. Assess the geotechnical problems using industry best software's
- **4. Analyse** the strength of various types of structural members as per the codal provisions.
- 5. **Design** the various civil Engineering structures using software's

UNIT – I

STRUCTURES: Structural Analysis of 2D and 3D Trusses, Structural Analysis of Continuous Beams using for different types of loadings and support conditions.

Structural Analysis of 2D and 3D Rigid and Braced Frames for different types of loadings, support conditions, section orientations and stiffness variation between columns and beams.

14 Hours

UNIT – II

GEOTECHNICAL: Analyzing and design of retaining walls using CAD software.

15 Hours

UNIT – III

DESIGN: Creating design sheets using Microsoft Excel.

10 Hours

Course Outcomes: At the end of the course the students should be able to

- 1. Explain the types analysis, structural analysis methods and procedure (L2)
- 2. Create 2D and 3D Models for analysis with various end conditions. (L3)
- 3. Plan a column orientation for different types of buildings (L5)
- 4. Analyse Retaining wall and 3D frames. (L3)
- 5. Design the analysed structures using MS Excel. (L6)

CO	PO1	PO2	PO3	PO4	PO5	PO6	P07	P08	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	2				3	2			2	2	2	2	2	2	
CO2	2	1			3	2			2	2	2	2	2	2	
CO3	2	2	2		3	2			2	2	2	2	2	2	2
CO4	2		2		3	2			2	2	2	2	2	2	
C05	2	2	2		3	2			2	2	2	2	2	2	2
1: Slight (Low) 2: Moderate (Medium)								3: Substantial (High)							

Mapping of POs & COs:

REFERENCES

- Punmia B. C., Ashok Kumar Jain, Arun Kumar Jain, "Strength of Materials and Theory of Structures", Volume I & Volume II, Laxmi Publications (P) Ltd., 2019.
- 2. Ramamrutham S., "Theory of Structures", Dhanpat Rai & Sons, New Delhi, 2018.
- 3. N. Krishnaraju and R. N. Pranesh, Reinforced Concrete Design (IS456:2000)-Principles and Practice, New Age International Publishers, New Delhi, 2006.
- 4. Dr. Ramchandra and Virendra Gehlot, Limit State Design of Concrete Structures (As per IS: 456-2000), Scientific Publishers (India), Jodhpur, 2010.
- 5. Punmia B.C.(2017) "Soil Mechanics and Foundations", Laxmi Publishing Co
- 6. IS: 456-2000 (to be supplied in the examination), SP16.

Scheme of Evaluation

CIE

A project report should include Analysis of beams with different end conditions, Analysis of 2D and 3D portal frames.

- 1. Analysis of beams and frames.
- 2. Design sheets for buildings and retaining wall

SEE

•	Analysis or Beams and frames software	e : 10 Marks
•	Analysis of Retaining walls	: 10 Marks
•	Design sheet for beams and columns	: 10 Marks
•	Design Sheet for retaining wall	: 10 Marks
3.	Viva voce	: 10 Marks
•	Total : 5	0 Marks
FUNDAMENTALS OF MACHINE LEARNING

Course Code	21CVE903	CIE Marks	50
Teaching Hours/Week (L:T:P)	1:0:4	SEE Marks	50
Total Hours	40	Credits	03

Course Learning Objectives:

This Course will enable students to:

1. Understand the need and basics of machine learning.

2. Learn ANN and Decision Tree model.

3. Explore the various learning algorithms using Supervised Learning.

4. Understand the important aspects of Analytical Learning and difference between Analytical and Inductive Learning Algorithms.

5. Analyse the techniques related to reinforcement learning.

UNIT – I

Introduction: Well posed learning problems, designing a Learning system, Perspectives and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version Space and Candidate Elimination Algorithm, Inductive Bias.

Decision tree: Representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm. Hypothesis Space Search, Inductive Bias, Issues in Decision Tree Learning.

Artificial Neural Networks: Introduction, Neural Network Representations, Appropriate problems, Perceptrons, Back propagation algorithm.

16 Hours

UNIT – II

Instance Based Learning: k-nearest neighbour learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

Bayesian Learning: Bayes theorem, Bayes theorem and concept Learning, Maximum Likelihood, Minimum Description Length, Bayes Optimal Classifier, Gibbs Algorithm, Naive Bayes Classifier, Bayesian Belief Networks, EM Algorithm.

Analytical Learning: PROLOG-EBG, Explanation Based Learning.

Combining Inductive and Analytical Learning: Inductive-Analytical Approaches

to Learning, Using Prior Knowledge to Initialize the Hypothesis, Alter the Search Objective, Augment Search Operators.

15 Hours

UNIT – III

Reinforcement Learning:

Learning Task, Q Learning, Non Deterministic Rewards and Actions, Temporal Difference Learning.

8 Hours

Course Outcomes:

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

- 1. Acquire the fundamental concept and importance of machine learning.
- 2. Demonstrate the application of Decision Tree and ANN and Genetic algorithm for real world problems.
- 3. Design and implement algorithms for supervised learning system.
- 4. Design and implement algorithms for Analytical and Inductive Learning.
- 5. Develop machine learning algorithm and reinforcement techniques for real world problems.

CO	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	2				3	2			2	2	2	2	2	2	
CO2	2	1			3	2			2	2	2	2	2	2	
CO3	2	2	2		3	2			2	2	2	2	2	2	2
CO4	2		2		3	2			2	2	2	2	2	2	
C05	2	2	2		3	2			2	2	2	2	2	2	2
1: Slight (Low) 2: Moderate (Medium)							3:	Subst	antial	(High)					

Mapping of POs & COs:

TEXTBOOK:

1. T. M. Mitchell, "Machine Learning", McGraw Hill, 2017.

REFERENCE BOOKS:

- 1. Ethem Alpaydin, "Introduction to Machine Learning", Second Edition, The MIT Press, 2004.
- 2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
- 4. R. O. Duda, P. E. Hart and D. G. Stork, "Pattern Classification", Wiley Publications, 2001.
- 5. T. Hastie, R. Tibshirani, J. Friedman. "The Elements of Statistical Learning", 2nd edition, 2008.
- 6. P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012.
- 7. K. P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
- 8. M. Mohri, A. Rostamizadeh, and A. Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
- 9. S. Russel and P. Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Prentice Hall, 2009.

E-Books / Online Resources:

- 1. https://in.mathworks.com/
- 2. https://www.kdnuggets.com/
- 3. https://blog.cambridgespark.

MOOC:

- 1. https://www.udemy.com/topic/
- 2. https://www.mooc-list.com/
- 3. https://peltarion.com (Build and deploy AI with deep learning platform)

GIS WITH QUANTUM GIS					
Course Code:	21CVE905	Course Type:	PEC		
Teaching Hours/Week (L: T: P: S):	2:0:2:0	Credits:	03		
Total Teaching Hours:	40	CIE + SEE Marks:	50+50		
Teaching I	Department: Civil En	gineering			
ourse Learning Objectives: This Co	ourse will enable stu	idents to			

Course | ctives: This Course will enable students

- 1. Explain the basic principles of remote sensing
- 2. Summarize the concepts of VIP and DIP
- 3. Explain the components and principles of GIS
- 4. Study the photogrammetry techniques

5.	Explains the concepts of GPS and applications							
	UNIT - I							
Intro	oduction; Remote Sensing	16 Hours						
Basi	Basics: Fundamentals of Remote Sensing, Electromagnetic Spectrum, Process of							
remo	remote sensing, Blackbody Radiation, Energy Interactions with earth atmosphere and							
surfa	ce features, spectral reflectance curves-For Vegetation, soil & wat	er.						
Sense	ors: Definition, Types (Typical Sensor used in optical remote s	sensing, Thermai						
561150								
	UNIT - II							
VIP a	and DIP	15 Hours						
Visua	al Image Interpretation: Definition, Objectives, Keys & Elements	of Visual Image						
inter	pretation. Digital Image Processing (DIP): Definition, Need, Stag	jes of DIP-Image						
rectif	ication & restoration,							
	UNIT - III							
GIS 8	& GPS	09 Hours						
GIS 8 Intro	& GPS duction, basics of GIS- definition of GIS, components of GIS	09 Hours , GIS work flow,						
GIS 8 Intro- repre	& GPS duction, basics of GIS- definition of GIS, components of GIS esenting	09 Hours , GIS work flow,						
GIS & Intro- represspatia	& GPS duction, basics of GIS- definition of GIS, components of GIS esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input	09 Hours , GIS work flow,						
GIS & Intro- repre spatia Coor Brief	& GPS duction, basics of GIS- definition of GIS, components of GIS esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS.	09 Hours , GIS work flow, Non spatial data						
GIS & Intro- repre- spatia Coor Brief Glob	& GPS duction, basics of GIS- definition of GIS, components of GIS esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS. al Positioning System, The 3 segments of GPS, How GPS Wor	09 Hours , GIS work flow, Non spatial data ks, Triangulation,						
GIS & Intro- repressation Spatia Coor Brief Globa Source	& GPS duction, basics of GIS- definition of GIS, components of GIS esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS. al Positioning System, The 3 segments of GPS, How GPS Wor ces of GPS Error, GPS Terminology, Applications	09 Hours , GIS work flow, Non spatial data ks, Triangulation,						
GIS & Intro- repress spati- Coor Brief Glob Source	& GPS duction, basics of GIS- definition of GIS, components of GIS esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS. al Positioning System, The 3 segments of GPS, How GPS Wor ces of GPS Error, GPS Terminology, Applications	09 Hours , GIS work flow, Non spatial data ks, Triangulation,						
GIS & Intro- repressoria Spatia Coor Brief Globa Source	& GPS duction, basics of GIS- definition of GIS, components of GIS esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS. al Positioning System, The 3 segments of GPS, How GPS Wor ces of GPS Error, GPS Terminology, Applications	09 Hours , GIS work flow, Non spatial data ks, Triangulation,						
GIS & Intro- repre- spati- Coor Brief Glob Source Cour	& GPS duction, basics of GIS- definition of GIS, components of GIS esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS. al Positioning System, The 3 segments of GPS, How GPS Wor ces of GPS Error, GPS Terminology, Applications	09 Hours , GIS work flow, Non spatial data ks, Triangulation,						
GIS & Intro- repre- spatia Coor Brief Glob Source Cour 1.	& GPS duction, basics of GIS- definition of GIS, components of GIS esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS. al Positioning System, The 3 segments of GPS, How GPS Wor ces of GPS Error, GPS Terminology, Applications rse Outcomes: At the end of the course student will be able to Explain the concepts of remote sensing	09 Hours , GIS work flow, Non spatial data ks, Triangulation,						
GIS & Intro- repre- spati- Coor Brief Glob- Source Cour 1. 2.	Be GPS duction, basics of GIS- definition of GIS, components of GIS esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS. al Positioning System, The 3 segments of GPS, How GPS Wor ces of GPS Error, GPS Terminology, Applications se Outcomes: At the end of the course student will be able to Explain the concepts of remote sensing Interpretation of digital images	09 Hours , GIS work flow, Non spatial data ks, Triangulation,						
GIS & Intro- repre- spati- Coor Brief Glob- Source Source Cour 1. 2. 3.	Be GPS duction, basics of GIS- definition of GIS, components of GIS, essenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS. al Positioning System, The 3 segments of GPS, How GPS Wor ces of GPS Error, GPS Terminology, Applications se Outcomes: At the end of the course student will be able to Explain the concepts of remote sensing Interpretation of digital images Explain the components of GIS	09 Hours , GIS work flow, Non spatial data ks, Triangulation,						
GIS & Intro- repressation Coor Brief Globa Source Cour 1. 2. 3. 4. 5	Be GPS duction, basics of GIS- definition of GIS, components of GIS, esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS. al Positioning System, The 3 segments of GPS, How GPS Wor ces of GPS Error, GPS Terminology, Applications se Outcomes: At the end of the course student will be able to Explain the concepts of remote sensing Interpretation of digital images Explain the components of GIS Understand the photogrammetric technique	09 Hours , GIS work flow, Non spatial data ks, Triangulation,						
GIS & Intro- repressor Spatia Coor Brief Globa Source Cour 1. 2. 3. 4. 5.	& GPS duction, basics of GIS- definition of GIS, components of GIS esenting al data, raster and vector data. dinate systems and map projections, datums, spatial data input, introduction to measurements in GIS. al Positioning System, The 3 segments of GPS, How GPS Wor ces of GPS Error, GPS Terminology, Applications se Outcomes: At the end of the course student will be able to Explain the concepts of remote sensing Interpretation of digital images Explain the components of GIS Understand the photogrammetric technique Explain the application of RS and GIS	09 Hours , GIS work flow, Non spatial data ks, Triangulation,						

С	Course Outcomes Mapping with Program Outcomes & PSO																	
	Prog	ram Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12		PSO	Ļ	
	↓ Cou	rse Outcomes													1	2	3	
		21CVE905.1	2	1	2	1	-	-	-	-	-	-	-	1	1	2	1	
	, ,	21CVE905.2	2	1	2	1	-	-	١	1	-	1	I	1	1	2	1	
	, ,	21CVE905.3	2	1	2	1	-	-	١	1	-	1	I	1	1	2	1	
		21CVE905.4	2	1	2	1	-	-	-	-	-	-	-	1	1	2	1	
		21CVE905.5	2	1	2	1	2	-	-	-	-	-	-	1	1	2	1	l
		1: Low 2: Medium	ı 3:	Hig	gh													
Т	EXTBO	OKS:																
	1.	Lillesand T.M., and	l R.\	<i>N</i> . K	liefe	er, "F	Rem	ote	ser	nsin	g ai	nd In	nage	inte	rpre	tatic	n",	
		4th edition, John	Wile	ey 8	ιSo	ns –	- 20	12.										
	2.	Christopher Jones	"Gl	[S ai	nd (Com	put	ter (Cart	ogr	aph	ιγ"ρι	ublica	ation	Pre	ntice	<u>)</u> -	
		Hall(2009)																
	3.	Lilly Sand, "Remot	e se	ensi	ng a	and	Ima	age	inte	erpr	etat	ion,	Johr	n Will	ley a	nd S	Sons,	
		New York 1999.								_		•		• •				
	4.	Manoj K. Arora, R.	C. E	sadj	atia	, " (·	1090	mat	ICS I	ng	inee	ering	", Ne	emich	nanc	181	sros.	
		Roorkee –2011.																
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		perspective", 2 nd E	diti	on.	Pre	ntic	e Ha	all –	19	96.	Jing		eme			9		
	3.	T.M Lillesand, R.W	/ Kie	efer.	. an	d J.'	WC	hip	mai	n, R	emo	ote s	ensir	na ar	nd In	nade	2	
		interpretation, 5t	h ec	ditio	n, J	ohn	Wi	ley	and	, So	ns I	ndia.	,	5	-	- 9		
	4.	Richards J A., X. Ji	a, "F	Rem	ote	ser	sin	g di	gita	l im	nage	e ana	alysis	: an	intro	duc	tion",	
		3 rd Edition, Sprin	ger	- 19	999.		•				5		5					
	5	Peter A. Burrough	& F	Racł	nel A	4. I∕	1cD	onn	el "	Prin	cip	es o	f gec	grap	ohic			
		information									-							
		systems"- (1998),	Oxf	ord	Uni	vers	sity	pre	ss, (Grea	at B	ritair	۱.					
	6	Mather P.M., "Com	npu	ter	prod	cess	ing	of r	em	otel	y se	ensed	d ima	ages:	an			
		introduction", Wile	еу	- 19	88.													

E Books / MOOCs/ NPTEL

1.	https://onlinecourses.nptel.ac.in/noc20_de04/preview
2.	https://onlinecourses.nptel.ac.in/noc22_ce26/preview

PYTHON PROGRAMMING						
Course Code	21CVE904	CIE Marks	50			
Teaching Hours/Week (L:T:P)	1:0:4	SEE Marks	50			
Total Hours	40	Credits	03			

Course Learning Objectives:

This Course will enable students to

- 1. Explain the elementary programming constructs and file operations and use it in Python programming.
- 2. Describe the concepts like strings, conversion of strings to numbers, lists, tuples, and dictionaries and use these in the python programming.
- 3. Illustrate the object oriented programming concepts in Python.
- 4. Construct a Graphical User Interface (GUI) and write a multi-threaded and a Client/Server program in Python.
- 5. Perform the database connection and Common Gateway Interface (CGI) programming in Python and Visualization with Matplotlib.

UNIT – I

Introduction to python, 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 evaluation.

Strings and text files; manipulating files and directories, text files: reading/writing text and numbers from/to a file.

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

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects inheritance, polymorphism, operator overloading (_eq_,_str_, etc); abstract classes; exception handling, try block.

Graphical user interfaces; event-driven programming paradigm; creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.

16 Hours

9 Hours

UNIT – III

Visualization with Matplotlib - General Matplotlib Tips, Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density

Creating simple web clients, introduction to CGI, CGI module, building CGI applications, python web application frameworks.

Course Outcomes:

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

- 1. Explain the basic program constructs and file operations in Python and express it.
- 2. Design the Python programs using the concepts like strings, conversion of strings to numbers, lists, tuples and dictionaries.
- 3. Implement the functions and object oriented programming concepts in python.
- 4. Create a Graphical User Interface, multiple threads and Client/Server programs in python.
- 5. Implement a database connection and CGI programs in python.

CO	P01	PO2	PO3	PO4	P05	PO6	P07	P08	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	3			3				1			3	2	2	
CO2	3	3			3				1			3	2	2	
CO3	3	3			3				2			3	2	2	2
CO4	3	3			3				3			3	2	2	
C05	3	3			3				2			3	2	2	2
		l: Slig	ht (Lo	t (Low) 2: Moderate (Medium)				3: Substantial (High)							

Mapping of POs & COs:

TEXTBOOKS:

- 1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, 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. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, ISBN: 978-0-13-274718-9, 2013.

REFERENCE BOOKS:

- 1. Chun, J Wesley, Core Python Programming, 2nd Edition, Pearson, 2007 Reprint 2010.
- 2. Python Cookbook, Third Edition, David Beazley and Brian K. Jones, Shroff Publishers & Distributors Pvt. Ltd., ISBN : 978-93-5110-140-6
- 3. Learning Python, Fifth Edition, Mark Lutz.
- 4. Programming Python (English) 4th Edition Mark Lutz.
- 5. Testing Python, David Sale, Wiley India (P) Ltd., ISBN: 978-81-265-5277-1.

OPEN ELECTIVE (VI Semester) - 2023-2024

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

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

Course Learning Objectives:

This course will enable the students to

- Understand the concepts of vectors, bases. 1.
- 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.
- Learn the concepts of singular value decomposition and PCA. 5.

UNIT - I

Vector spaces

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

Linear Transformations

Canonical Forms

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

UNIT - II

Inner Product Spaces

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

Symmetric Matrices and Quadratic Forms:

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

UNIT - III

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												
C01	3	2										
CO2	2	2										
CO3	3	1										
CO4	3	2										
CO5	3	2										

15 Hours

15 Hours

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:

2. The class teacher must decide the topic for closed book test and Written Quiz. In the beginning only teacher must announce the methods of CIE for the subject.

Semester End Examination:

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

TEXTBOOKS:

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

INTELLECTUAL PROPERTY RIGHTS

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

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

			U	NIT	- 1									
Introduction to Intellectual Property Invention and Creativity - Intellectual Property (IP) – Importance, Jurisprudential definition and concept of property, rights, duties and their correlation; History and evaluation of IPR – like Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications.														8
Agreements and Treaties History - General Agreement on Trade and Tariff (GATT). Indian Position vis-a-vis WTO and Strategies; TRIPS Agreement; Madrid Agreement; Hague Agreement; WIPO Treaties; International convention relating to Intellectual Property - Establishment of WIPO - Mission and Activities – Budapest Treaty; PCT; Indian Patent Act 1970 & recent amendments – Patent (Amendment) Rules, 2117														8
			T	NIT -	π									
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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L House a Constant understanding of the	se stu		WIII D		$\frac{e}{t}$	ahta								
 Have a General understanding of the Have awareness of different form legislations. 	ns of	inte	llectu	al pr	opert	y rig	hts,	natio	nal a	nd in	ternat	ional	IPR r	elated
3. Have a general understanding abo	out th	ne pr	ovisio	ons, j	privil	eges	and	limit	ation	s of i	ntelled	ctual p	oroper	ty right
holders with an understanding of th	ne leg	gal as	pects	(civi	l or c	rimin	al) o	of the	use o	f intel	lectua	l prop	erty ri	ghts.
4. Acquire Knowledge of National and intellectual property rights		ing o	f pote	nting	e Ag	reeme			genc		liction	ing in	relatio	
3. De aware and have a general under	stand	ing o	i pau	mme	; proc	cuur	cs an		1151112	5.				
Course Outcomes Mapping with Progra	m Oı	utcon	nes &	: PSC)									
Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PS	SO↓
↓ Course Outcomes						-	<u> </u>						1	2
	_	3	3	2		3			2	2		3		
	2	2	5	n	<u> </u>	3		5	1	1	2	2		
C04	2		1	1		3			2 1	2	2	3		<u> </u>
CO5	3	2	1	1		3			3	1		2		
1: Low 2: Medium 3: High		<u> </u>	<u> </u>	ı	ı	<u> </u>	1	1	<u> </u>	1	1	1 -	1	L]
REFERENCE MATERIALS: 1. BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., 2107 2. Kankanala C. Connetic Potent Law & Strategy 1st Edition Manuature Information Solution Data Ltd., 216											td., 21 tion P	107 Pvt. Ltc	1., 210	17
2. Kankanala C., Genetic Patent Law &	z Stra	 Subbaram N.R. "Handbook of Indian Patent Law and Practice", S. Viswanathan (Printers and Publis) 												
 Z. Kankanala C., Genetic Patent Law & Subbaram N.R. "Handbook of Indi 	an Pa	atent	Law	and	Pract	tice",	S. V	/iswa	natha	ın (Pr	inters	and P	ublish	ers) Pvt.
 Kankanala C., Genetic Patent Law & Subbaram N.R. "Handbook of Indi Ltd., 1998. 	an Pa	atent	Law	and	Pract	tice",	S. V	/iswa	natha	in (Pr	inters	and P	ublish	ers) Pvt.
 Kankanala C., Genetic Patent Law & Subbaram N.R. "Handbook of Indi Ltd., 1998. Eli Whitney, United States Patent N Intellectual Property Today: Volume 	an Pa umbe	atent er: 72	Law X, Co	and otton	Pract Gin,	tice", Marc	S. V h 14	/iswa , 1794	natha I.	in (Pr	inters	and P	ublish	ers) Pvt.
 Kankanala C., Genetic Patent Law & Subbaram N.R. "Handbook of Indi Ltd., 1998. Eli Whitney, United States Patent N Intellectual Property Today: Volume WTO and International Trade by M 	umbe 8, N B Ra	atent er: 72 o. 5, o. Vi	Law X, Co May	and otton 2101, Publis	Pract Gin,	tice", Marc	S. V h 14 se Pv	/iswa , 1794 rt. Ltd	natha I.	in (Pr	inters	and P	ublish	ers) Pvt.

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

ENVIRONMENTAL IMPACT ASSESSMENT

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

Course Learning Objectives:

This Course will enable students to

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

UNIT-I

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

16 Hours

UNIT - II

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

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.

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.

10 Hours

13 Hours

Cour	SC 111	iculai	1011 111	auna											
СО	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:	Note:- 1:Low 2:Medium 3: High														

Course Articulation Matrix :

Note:- 1:Low 2:Medium

TEXTBOOKS:

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

ADDITIONAL REFERENCE MATERIALS

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

NPTEL SOURCES

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

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

Co	urse 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

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

Course Articulation Matrix

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

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

PROFESSIONAL & COGNITIVE COMMUNIQUÉ

Cou	ırse Code	21HU8X24	Course Type OE	С						
Tea	ching Hours/Week (L:T:P:S)	3:0:0:0	Credits 03							
Tot	al Teaching Hours	39+0+0	CIE + SEE Marks 50+	50						
	Теас	hing Department: H	lumanities	I						
Сош	se Learning Objectives.	ning Department. II	lumanities							
1.	To Problematize Commonsense & Apply	Critical thinking skil	ls							
2.	Comprehend etiquettes and manners in d	ifferent situations								
3.	Be gender sensitive in both offline and on	nline behavior								
4.	Exhibit better comprehension of the social	al implications of hun	nan body							
5.	Understand the importance of reading an	d writing skills								
		UNIT - I								
Common sense and Emotional Intelligence Common sense, Commonsensical Consensus, Critical thinking, Unsettling commonsensical Consensus, Role of language in Common sense and Critical Thinking; Nature & Functions of Emotional Intelligence, Emotions, Intelligence and Creativity, Growth of Emotional Intelligence Etiquettes & Workplace Etiquettes, Workplace Readiness Skills, Significance of Cross-Cultural Understanding; Cultural Sensitivity, Impact of social media in Workplace										
		UNIT - II								
Socia	l Networking Sites and its Impacts	01011-11								
Emer socia	rgence of social media, Impacts on Gender a l media, Offline Norms & Online Behavio	and Self Representation	on, Regulatory and Liberatory aspects of	15						
Gend Gend Repre Disci	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									
		IINIT - III								
Writ	ing	01111 - 111								
Type Read	s of Writing, Note Taking Methods, Plagian ling s of Reading, Types of Reading.Scanning.	rism Skimming		9						
	<i>6, 7</i> , <i>6</i> , <i>7</i> , <i>6</i> , <i>7</i> , <i>6</i> , <i>7</i> , <i>6</i> , <i>7</i> , <i>7</i> , <i>7</i> , <i>6</i> , <i>7</i>	C								

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

1.	Problematize Commonsense	& Apply	Critical thinking skills
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- 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	PS	PSO↓	
↓ Course Outcomes													1	2	
CO1		3							3	3		3			
CO2		2						3	2	3		2			
CO3		3							2	2		3			
CO4		3							2	2		3			
CO5		2							3	3		2			

1: Low 2: Medium 3: High

REFERENCE MATERIALS:

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

E-RESOURCES:

- 1. http://www.cyberpsychology.eu/view.php?cisloclanku=2109061501/ >.
- 2. http://www.surveillance-and-society.org/articles2(2)/webcams.pdf
- 3. http://eprints.rclis.org/19790/>.

	OPERATIONS MANAGEMENT & ENTREPRENEURSHIP												
Cou	ırse code	21ME8X28	CIE Marks	50									
Tea	ching Hours/Week (L:T:P)	k (L:T:P) (3:0:0) SEE Marks 50											
Tot	al Hours	39	Credits	03									
Cou	Course Learning Objectives: This Course will enable students to,												
1	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 Quali	ty tools and methods in	n operations management										
3	Analyze the data draw variable p salient issues concerning reliability	rocess control charts	and determine process capal	bility; Understand									
4	Understand the issues related to ent carried out during project appraisal	repreneurship, charact	eristics of an entrepreneur and	l different studies									
5	Identify and differentiate the differentiate	ent national and state le	vel 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.

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

8 Hours

Course Outcomes (CO)

CO 1	Differentiate production and service systems. Discuss continuous and intermittent production systems with their advantages and disadvantages. Discuss CRM and ERP systems.
CO 2	Discuss Total Quality Management tools and methods. Solve problems on fundamentals of statistics and normal distribution.
CO 3	Draw and Analyze variable process control charts and determine process capability. Calculate reliability of series and parallel systems using the information on failure rate and time.
CO 4	Discuss entrepreneurship, characteristics of an entrepreneur and barriers to entrepreneurship. Discuss the elements of a project report and feasibility studies conducted in the project appraisal.
CO 5	Identify and differentiate the national and state level funding agencies. Discuss the effect of GATT and WTO on Indian economy.

TEXTBOOKS:

- 1. **Production / Operations Management**, Joseph G Monks, McGraw Hill Books
- 2. **Production and Operations Management**, William J Stevenson, Tata McGraw Hill, 8th Edition.
- 3. Statistical Quality Control: RC Gupta, Khanna Publishers, New Delhi, 2105.
- 4. **Total Quality Management**: Dale H. Besterfield, Pearson Education, 2103.
- 5. Dynamics of Entrepreneurial Development & Management -
- Vasant Desai Himalaya Publishing House
- 6. Entrepreneurship Development Poornima.M.Charantimath Small Business Enterprises Pearson Education 2106 (2 & 4).

REFERENCE BOOKS:

- 1. Statistical Quality Control: E.L. Grant and R.S. Leavenworth, 7th edition, McGraw-Hill publisher.
- 2. Statistical Process Control and Quality Improvement: Gerald M. Smith, Pearson Prentice Hall. ISBN 0-13-049036-9.
- 3. Statistical Quality Control for Manufacturing Managers: W S Messina, Wiley & Sons, Inc. New York, 1987
- 4. **Statistical Quality Control:** Montgomery, Douglas, 5th Edition, John Wiley & Sons, Inc. 2105, Hoboken, NJ (ISBN 0-471-65631-3).
- 5. Principles of Quality Control: Jerry Banks, Wiley & Sons, Inc. New York.
- $6. \quad \textbf{Entrepreneurship Development} S.S.Khanka S.Chand \& Co.$

MOOC/NPTEL Resources:

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

Course Articulation Matrix

Cour	Course Code / Name: 18ME8X28/ Operations Management & Entrepreneurship														
Course	Program Outcomes (PO)														
Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C-21ME8X28.1	3	1	0					1	1	1	1				
C-21ME8X28.2	1	2	0						1	1	3				
C-21ME8X28.3	2	2	0				1	0	1	1	3				
C-21ME8X28.4	3	1	0			1	0	1	1		2				
C-21ME8X28.5	1	1	0			1	1	1	1		3				

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

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

INTRODUCTION TO PYTHON PROGRAMMING											
Course Code	21IS8X38	CIE Marks	50								
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50								
Total Hours	39	Credits	03								

Prerequisites:

Student must have fundamental knowledge of procedure-oriented programming.

Course Learning Objectives (CLOs):

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

- Construct Python programs using data types and looping.
- Design object-oriented Python programs using classes and objects.
- Design useful stand-alone and CGI applications in Python.

UNIT - I

INTRODUCTION: Introduction to python, Installing Python; basic syntax, interactive shell, editing, saving, and running a script. The concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages. Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation.

STRING MANIPULATIONS: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa, Binary, octal, hexadecimal numbers

LISTS, TUPLES, AND DICTIONARIES: Basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

15 Hours

UNIT – II

FUNCTIONS: Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions

CLASSES AND OOP: Classes, objects, attributes and methods; defining classes; design with classes, data modelling; persistent storage of objects, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; exception handling, try block

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

15 Hours

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

Course Outcomes:

	Table: Mapping of COs to PIs, POs and BTL											
Course Outcomes (COs)	Program Outcomes (POs) Addressed	Performance Indicators (PI)	Bloom's Taxonomy Level (BTL)									
CO1	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1	L2									
CO2	1,2,3	1.4.1,1.3.1,2.3.1,3.1.1,3.2.2	L3									
CO3	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1,3.1.6,3.2.1,3.2.2	L3									
CO4	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1,3.1.6,3.2.1,3.2.2	L3									
CO4	1.2.3	1.4.1.1.3.1.2.1.1.2.1.2.2.2.4.3.1.1.3.1.6.3.2.1.3.2.2	L3									

Mapping Course Outcomes with Programme Outcomes:

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

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

TEXTBOOK:

1) Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2111, Cengage Learning, ISBN: 978-1111822705

ADDITIONAL RESOURCES: 1. <u>Think Python</u>. PDF is free.

SEE Question Paper Pattern:

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

BIOFUEL ENGINEERING											
Course Code	21BT8X40	CIE Marks	50								
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50								
Total Hours	39	Credits	03								

Prerequisites: Nil

Co-requisites: Nil

Course Learning Objectives:

The objective of this course is

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

UNIT – I

LIQUID BIOFUELS

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

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

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

15 Hours

UNIT – II

BIOHYDROGEN AND MICROBIAL FUEL CELLS

Enzymes involved in H_2 Production; Photobiological H_2 Production: Biophotolysis and Photofermentation; H_2 Production by Fermentation: Biochemical Pathway, Batch Fermentation, Factors affecting H_2 production, Carbon sources, Detection and Quantification of H_2 . Reactors for biohydrogen production.

Microbial Fuel cells: Biochemical Basis; Fuel Cell Design: Anode & Cathode Compartment, Microbial Cultures, Redox Mediators, Exchange Membrane, Power Density; MFC Performance Methods: Substrate & Biomass Measurements, Basic Power Calculations, MFC Performance: Power Density, Single vs Two-Chamber Designs, Wastewater Treatment Effectiveness; Advances in MFC.

15 Hours

UNIT – III

RECOVERY OF BIOLOGICAL CONVERSION PRODUCTS

Biogasification of municipal solid waste: Anaerobic processing; Types of digesters, Biogas plant in India.

Thermochemical processing: Planning an incineration facility, Incineration technologies: Mass burning system; Refuse derived fuel (RDF) system; modular incineration; Fluidized bed incineration; energy recovery; Fuel production through biomass incineration, Pyrolysis and gasification, hydrothermal processing.

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:

		РО										
СО	1	2	3	4	5	6	7	8	9	10	11	12
CO1		М							L			
CO2		М							L			
CO3		М							L			
CO4		М							L			
CO5		М							L			

REFERENCE BOOKS:

- 1. Drapcho, C. M., Nhuan, N. P. and Walker, T. H. *Biofuels Engineering Process Technology*, Mc Graw Hill Publishers, New York, 2108.
- 2. Jonathan R.M, *Biofuels Methods and Protocols (Methods in Molecular Biology Series)*, Humana Press, New York, 2109.
- 3. Olsson L. (Ed.), *Biofuels (Advances in Biochemical Engineering/Biotechnology Series, Springer-Verlag Publishers, Berlin, 2107.*
- 4. Glazer, A. and Nikaido, H. *Microbial Biotechnology Fundamentals of Applied Microbiology*, 2 Ed., Cambridge University Press, 2107.
- 5. Godfrey Boyle (Ed). *Renewable Energy- Power for sustainable future*, 3rd Ed. Oxford. 2112.
- 6. Ramachandran, T. V. *Management of municipal solid waste*. Environmental Engineering Series. Teri Press, 2116.

SEE QUESTION PAPER PATTERN:

Unit No.	Ι	Π	III
Questions to ask (21 marks/Qn)	3	3	2
Questions to answer	2	2	1

SOLID WASTE MANAGEMENT

Course Code	21BT8X42	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Prerequisites: Nil

Co-requisites: Nil

Course Learning Objectives:

The objective of this course is

1. To learn types of solid wastes, collection, treatment and disposal methods.

2. To understand various processing techniques and regulations of treatment and disposal.

UNIT – I

INTRODUCTION TO SOLID WASTES AND ITS SEGREGATION & TRANSPORTATION

Solid waste – Definition, Sources of waste, Classification of Solid waste, Characteristics of Solid Waste (Physical, Chemical, Biological), Solid waste problems – impact on environment and health. Concept of waste reduction, recycling and reuse.

Waste collection and segregation: Solid waste generation, Onsite handling and segregation of wastes at source, Collection and storage of municipal solid wastes, Equipment used and manpower required in collection, Collection systems and routes.

Transportation: Transfer stations: types, location, maintenance, Methods and means of transportation.

UNIT – II

PROCESSING TECHNIQUES, RECOVERY OF RESOURCES AND WASTE DISPOSAL

Processing Techniques: Unit operations for separations and processing, mechanical and thermal volume reduction, Incineration of solid wastes – process and types of incinerators (liquid injection, rotary kiln and fluid bed), Biological processing – composting, vermicomposting, biomethanation, fermentation, Drying and dewatering of wastes.

Recovery of Resources: Heat recovery in incineration process, energy recovery and conversion of products from biological processes.

Dumping of solid wastes, Landfills – Types, site selection, preliminary design, operation, case study, Advantages and disadvantages of landfills, Leachate and landfill gases: Collection and treatment, Landfill disposal for hazardous wastes, biomedical waste.

16 Hours

UNIT – III

SOLID WASTE MANAGEMENT RULES AND PLANNING ISSUES

Legislative trends and impacts: Major legislations, Government agencies. Municipal Solid Waste Management Act (1999), Hazardous Wastes (Handling and Management) Rules, Biomedical Waste (Handling and Management) Rule (1998), e-Waste (Management and Handling) Rule 2111.

Planning and developing a site for solid waste management, Site Remediation: Assessment and Inspection, Remedial techniques, Siting guidelines.

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:

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

REFERENCE BOOKS:

- 1. Tchobanaglous, G., Theisen, H. and Vigil, S. A. Integrated Solid Waste Management, McGraw Hill. 1993.
- 2. Tchobanoglous, G., Thiesen, H., Ellasen, *Solid Waste Engineering Principles and Management*, McGraw Hill, 1997.
- 3. Landrefh, R. E. And Rebers, P. A. Lewis, Municipal Solid Wastes-Problems & Solutions, 1997.
- 4. Bhide, A. D. and Sundaresan, B. B. *Solid Waste Management in Developing Countries*, Indian National Scientific Documentation Centre. New Delhi, 2100.

8 Hours

15 Hours

SEE QUESTION PAPER PATTERN:

Unit No.	Ι	II	III
Questions to ask (21 marks/Qn)	3	3	2
Questions to answer	2	2	1

PCB DESIGN									
Course Code	21EC8X59	CIE Marks	50						
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50						
Total Hours	39	Credits	03						

Pre-requisites:

Basic electrical and electronics engineering.

Course Learning Objectives:

- 1. To enable students to gain knowledge of Schematic Design techniques & PCB design techniques
- 2. To expose students to complete PCB Design & manufacturing process

List of Experiments

- Introduction to PCB design tool: building a schematic circuit and layout
- Exploring the PCB design tool by creating new components, using existing components and footprint, simulation features, Active & Passive Components
- Drawing a PCB layout in a single layer with constraints such as board area, track width, packages, via etc
- Creating a double layer PCB for a given schematic circuit
- Creating and using different component package types
- Fabrication of single and double layer PCB on a copper clad board using hatching/engraving technique.
- Handling PCB prototype machine using Mach3 CNC tool for the PCB prototype.

Detailed Course Plan

Lab 1

Introduction to PCB design tool : building a schematic circuit.

Lab 2

Creating Library & Components, using existing components and footprint, simulation features, Active & Passive Components.

Lab 3

Designing a single layer PCB for given schematic circuit diagram, Gerber file generation.

Lab 4

Designing a double layer PCB for given schematic circuit diagram, Gerber file generation.

Lab 5

Simulating digital and analog circuits for given test cases.

Lab 6

Handling programmable microcontroller circuit in the simulation environment of schematic editor .

Lab 7

Defining a footprint for a component in the PCB layout.

Lab 8

Fabrication of single layer PCB using PCB prototype machine – Generating bit filein Copper Cam tool.

Lab 9

Fabrication of single layer PCB using PCB prototype machine – Setting up Mach3 CNC tool.

Lab 10

Fabrication of double layer PCB using PCB prototype machine – Generating bit file in Copper Cam tool.

Lab 11

Fabrication of double layer PCB using PCB prototype machine -Setting up Mach3 CNC tool.

Lab 12

Component placement and soldering.

Lab 13

Desoldering and testing.

Scheme of SEE Examination

It is a 3-Hour exam at the end of the semester where the student is to demonstrate the PCB designing process.

Sl.No	Activity	Max. Marks					
1	Creating schematic for a given circuit diagram	15					
2	PCB Layout design	21					
3	Setting up fabrication	15					
Total 50							

Course Outcomes:

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

- 1. Draw schematic circuit and create PCB layout for single or multilayer PCB
- 2. Fabricate single and double-layer PCB using Mach3Mill operated CNC machine.

INNOVATION AND ENTREPRENEURSHIP									
Course Code	21ME8X63	CIE Marks	50						
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50						
Total Hours	39	Credits	03						

Pre	requisites:								
The	The student must have learnt basics of Engineering concepts, applications and business as a whole.								
Сог	Course Learning Objectives: This Course will enable students to,								
1	Understand Technological Innovation								
2	Understand Innovation management and the difference between Invention and Innovation	n.							
3	Appreciate the importance of Innovation as management process and Innovation management	ement techniques.							
4	4 Define Innovation system and Understand the importance of Technology management and Transfer.								
5	5 Identify Technological Entrepreneurship and its types and Understand the Institutional support provided								
	for Entrepreneurs								
	UNIT – I								
INT	RODUCTION TO TECHNOLOGICAL INNOVATION	14 Hours							
Bas	ic Concepts and Definitions: Technology - Technology Management - Invention - Creat	ivity – Innovation							
- Tl	ne Concept of Technological Innovation - Innovation Posture, Propensity and Perform	ance - Innovation							
Mea	asurement - Key factors linking creativity and innovation - Classifications of Innovat	tions – Innovation							
Proc	Process.								
INT	INTRODUCTION TO INNOVATION MANAGEMENT								
Inno	ovation Management Through Management of Knowledge and Education – Types of Lea	rning - Difference							
Bet	ween Innovation and Invention - Types and Characteristics of Innovation.								
INN	OVATION AND COMPETITIVENESS								
Cas	e Study – Barriers for Innovation and Competitiveness.								

INNOVATION AS A MANAGEMENT PROCESS

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 SUDDODT								

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
1	Theory, Policy and Practice", Springer, 2115.

REFERENCE BOOKS:

1 Dick Whittington, "Digital Innovation and Entrepreneurship", Cambridge University Press, 2118.

Course Code / Name : 21ME8X63/ INNOVATION AND ENTREPRENEURSHIP														
Course					Prog	gram	Outco	mes (PO)				PSO	
Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C-21ME8X63.1	3	2				1	1		1			1	3	1
C-21ME8X63.2	3	2				1	1		1			1	3	1
C-21ME8X63.3	2	2				1	1		1			1	3	1
C-21ME8X63.4	2	2				1	1		1			1	3	1
C-21ME8X63.5	3	2				1	1		1			1	3	1

Course Articulation Matrix:

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

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

14 Hours

	INTR	RODUC	TION TO	YOGA			
Course Code:		21H	U 8X68	Cou	rse Type		OEC
Teaching Hours/Week (L:T:P: S)		3:0:0):0	Cree	lits		03
Total Teaching Hours		39		CIE	+ SEE M	arks	50+50
Total Feaching Hours		07				i no	20120
	ng Dep	artmen	t: Mechai	lical Eng	ineering		
Course Learning Objectives:	lonmon	tofVog					
I. To give a brief instory of the devel Joint for the devel	al toxts	$\frac{10110g}{00}$	a				
2. Identify names of different classic 3. To illustrate how Yoga is important	at tor he	oli i Oga	ing				
4 To explain the Asanas and other Y	ogic pra	attices	mg				
5 To explain how Yoga practices ca	in he an	plied for	· overall ir	nroveme	nt		
ro explain, now rogu plactices et	in oe up	pried for	overun n	iprovenia			
		U	NIT – I				
		U1					
Yoga: Meaning and initiation, definitions a	and basi	s of yog	a, History	and deve	elopment, A	Astanga yoga,	
Streams of yoga. Yogic practices for health	y living				-		09 Hours
General guidelines for Yoga practices for t	he begir	nners: A	sanas, Pra	nayama.			
	••					· · ·	
Classification of Yoga and Yogic text	s:Yogas	sutra of	Patanjal	i, Hatha	yogic pr	actices- Asanas,	07 Hours
Pranayama, Dharana, Mudras and bandhas	•						
		UN	NT – TI				
Yoga and Health: Concept of health and D	iseases-	Yogic c	oncept of	body – pa	ancakosavi	veka, Concept of	
disease according to Yoga Vasistha.		0	1	• •		· •	06 Hours
Yogic concept of healthy living- rules & re	egulatio	ns, yogi	c diet, aha	ra, vihara	a. Yogic co	ncept of holistic	04 Hours
health.							
Analis d Vana fan alamantam a duastian Da	rsonalit	v develo	nment_ n	hysical le	vel mental	level emotional	
$\Delta nn ne \alpha + \alpha no \alpha + \alpha ne \alpha + \alpha ne \alpha + \alpha $	asonam	y ueven	pinent- p	nysicai ic	ver,menta	ic ver,emotionai	04 Hound
level. Specific guidelines and Yoga practic	es f or -	Concen	tration de	velopmei	nt.Memorv	development	04 Hours
level. Specific guidelines and Yoga practic	es f or -	Concen	tration de	velopme	nt,Memory	development	04 Hours
level. Specific guidelines and Yoga practic	es f or -	Concen	Itration de	velopmer	nt,Memory	development	04 Hours
Yoga and physical development: Mind-b	es f or - ody, M	Concen UN editatior	ntration de N IT - III 1, Yogasa	nas and	ht,Memory	development . Different Yoga	04 Hours
Yoga and physical development: Mind-b practices and Benefits.	ees f or - ody, M	Concen UN editation	N IT - III n, Yogasa	velopmen nas and	ht,Memory	development . Different Yoga	05 Hours
Yoga and physical development: Mind-b practices and Benefits.	ody, M	Concentrum UN editation	NIT - III n, Yogasa	nas and	heir types	development . Different Yoga	04 Hours 05 Hours
Applied Yoga for elementary education: Pe level. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for	ody, M – Flexib	Concen UN editation pility, Sta	ntration de N IT - III n, Yogasa amina, En	nas and the durance (ht,Memory heir types Surya Nan	development . Different Yoga naskara)	04 Hours 05 Hours 04 Hours
Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for	ody, Ma - Flexib	Concen UN editation bility, Sta	ntration de NTT - III n, Yogasa amina, En	nas and the durance (heir types Surya Nan	development . Different Yoga naskara)	04 Hours 05 Hours 04 Hours
Applied Yoga for elementary education: Pellevel. Specific guidelines and Yoga practic Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for Course Outcomes: At the end of the course 1 Understand a brief bistory of the d	es f or - ody, Ma - Flexib se stude	Concen UN editation bility, Sta nt will b	NT - III NT - III n, Yogasa amina, En <u>e able to</u> Yoga	nas and the durance (heir types Surya Nan	development . Different Yoga aaskara)	04 Hours 05 Hours 04 Hours
Applied Yoga for elementary education: Pelevel. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for Course Outcomes: At the end of the course 1. Understand a brief history of the d 2. Know important practices and print	ody, M – Flexib se studen levelopr	Concern UN editation pility, Sta nt will b nent of Yoga	Atration de NTT - III n, Yogasa amina, En e able to Yoga	nas and the durance (heir types Surya Nan	development . Different Yoga naskara)	04 Hours 05 Hours 04 Hours
Applied Yoga for elementary education: Pellevel. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for Course Outcomes: At the end of the course 1. Understand a brief history of the d 2. Know important practices and print 3. Explain how Yoga is important for	es f or - ody, M - Flexib se studer levelopr nciples o r health	Concern UN editation bility, Sta nt will b nent of V of Yoga	Atration de NT - III n, Yogasa amina, En e able to Yoga	unas and the durance (heir types Surya Nan	development . Different Yoga naskara)	04 Hours 05 Hours 04 Hours
 Applied Yoga for elementary education: Pellevel. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for Course Outcomes: At the end of the course 1. Understand a brief history of the d 2. Know important practices and print 3. Explain how Yoga is important for 4. Practice meditation to improvement 	es f or - ody, M - Flexib se studer levelopr nciples or r healthy	Concern UN editation bility, Sta nt will b ment of Yoga y living ncentrat	Atration de NTT - III n, Yogasa amina, En e able to Yoga	velopmen nas and t durance (heir types Surya Nan	development . Different Yoga naskara)	04 Hours 05 Hours 04 Hours
 Applied Yoga for elementary education: Pellevel. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for a specific guidelines and Yoga practices for a specific guidelines. Course Outcomes: At the end of the course 1. Understand a brief history of the d 2. Know important practices and print 3. Explain how Yoga is important for 4. Practice meditation to improveme 5. Have knowledge about specific guidelines and Yoga practices for a specific guidelines. 	es f or - ody, M - Flexib se studen levelopr nciples o r healthy nt of con idelines	Concern UN editation bility, Sta nt will b ment of Y of Yoga y living ncentrat	ITT - III n, Yogasa amina, En e able to Yoga ion etc. a practices	durance (heir types	development . Different Yoga naskara)	04 Hours 05 Hours 04 Hours
Applied Yoga for elementary education: Perelevel. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for Course Outcomes: At the end of the course 1. Understand a brief history of the d 2. Know important practices and print 3. Explain how Yoga is important for 4. Practice meditation to improveme 5. Have knowledge about specific guideline guidel	es f or - ody, M - Flexib se studer levelopr nciples or r healthy nt of con idelines	Concent UN editation bility, Stant nt will b nent of Yoga y living ncentrat s of yoga	Atration de NTT - III n, Yogasa amina, En e able to Yoga ion etc. a practices	durance (heir types Surya Nan	development . Different Yoga naskara)	04 Hours 05 Hours 04 Hours
Applied Yoga for elementary education: Perelevel. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for Course Outcomes: At the end of the course 1. Understand a brief history of the d 2. Know important practices and print 3. Explain how Yoga is important for 4. Practice meditation to improveme 5. Have knowledge about specific guidelines	es f or - ody, M - Flexib se studen levelopr nciples or r health int of con idelines m Outc	Concern UN editation bility, Sta nt will b ment of V of Yoga y living ncentrat s of yoga	IT - III n, Yogasa amina, En e able to Yoga ion etc. a practices	durance (heir types	development . Different Yoga naskara)	04 Hours 05 Hours 04 Hours
Applied Yoga for elementary education: Perelevel. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for Course Outcomes: At the end of the course 1. Understand a brief history of the d 2. Know important practices and print 3. Explain how Yoga is important for 4. Practice meditation to improveme 5. Have knowledge about specific guide Course Outcomes Mapping with Progra	- Flexition - Flex	Concern UN editation bility, Sta nt will b ment of Yoga y living ncentrat s of yoga comes & 2 3	ITT - III n, Yogasa amina, En e able to Yoga ion etc. a practices PSO 4 5	durance (heir types	development . Different Yoga naskara) 10 11 12	04 Hours 05 Hours 04 Hours 04 Hours
Applied Yoga for elementary education: Perelevel. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for Course Outcomes: At the end of the course 1. Understand a brief history of the d 2. Know important practices and print 3. Explain how Yoga is important for 4. Practice meditation to improveme 5. Have knowledge about specific guidelines Program Outcomes→ ↓ Course Outcomes	- Flexib se studen levelopr nciples or n healthy nt of con idelines m Outc 1 2	UN editation oility, Standard oility, Standard nt will b nent of Yoga y living ncentratt s of yoga 2 3	ITT ation de ITT - III n, Yogasa amina, En e able to Yoga ion etc. a practices PSO 4 5	durance (heir types Surya Nan	development . Different Yoga naskara) 10 11 12	04 Hours 05 Hours 04 Hours 04 Hours 05 Hours 04 Hours
Applied Yoga for elementary education: Perelevel. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for Course Outcomes: At the end of the course 1. Understand a brief history of the d 2. Know important practices and print 3. Explain how Yoga is important for 4. Practice meditation to improveme 5. Have knowledge about specific guidelines Course Outcomes Mapping with Progra Program Outcomes → ↓ Course Outcomes	- Flexib e studen e studen r healthy nt of con idelines m Outc	UN editation oility, Standard oility, Standard nt will b nent of Yoga y living ncentratt s of yoga 2 3	ATT - III ATT - III A, Yogasa amina, En e able to Yoga ion etc. a practices PSO 4 5	durance (heir types Surya Nan	development Different Yoga haskara) 10 11 12 1 1	04 Hours 05 Hours 04 Hours 04 Hours PSO↓ 1 2
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Applied Yoga for elementary education: Pelevel. Specific guidelines and Yoga practice Yoga and physical development: Mind-b practices and Benefits. Specific guidelines and Yoga practices for Course Outcomes: At the end of the course 1. Understand a brief history of the d 2. Know important practices and print 3. Explain how Yoga is important for 4. Practice meditation to improveme 5. Have knowledge about specific guidelines Program Outcomes→ ↓ Course Outcomes CO1 CO2 CO3	- Flexib es studen evelopm nciples or nealthy nt of con- nidelines m Outc	Concent UN editation oility, State nt will b nent of Yoga y living ncentrat s of yoga comes & 2 3	amina, En e able to Yoga ion etc. a practices	velopmen nas and durance (6 7 1 1 2	heir types Surya Nan 8 9 1 1 1 1	development . Different Yoga naskara) 10 11 10 11 10 3 3 3	04 Hours 05 Hours 04 Hours 04 Hours
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Applied Yoga for elementary education: Perelevel. Specific guidelines and Yoga practiceYoga and physical development: Mind-b practices and Benefits.Specific guidelines and Yoga practices forCourse Outcomes: At the end of the course1.Understand a brief history of the d2.Know important practices and print3.Explain how Yoga is important for4.Practice meditation to improveme5.Have knowledge about specific guidelinesCourse Outcomes Mapping with PrograCourse Outcomes Mapping with PrograCourse OutcomesCO1CO1CO2CO3CO4CO4	es f or - ody, M - Flexib se studen evelopm nciples or r healthy idelines m Outc 1 2	Concern UN editation oility, Sta nt will b ment of V of Yoga y living ncentrat s of yoga comes & 2 3	Arration de ATT - III n, Yogasa amina, En e able to Yoga ion etc. a practices PSO 4 5	ovelopmen nas and durance (durance (1 2 3 2	heir types Surya Nan 8 9 1 1 1 2 2 2	development . Different Yoga naskara) 10 11 10 11 10 3 3 3 3 3	04 Hours 05 Hours 04 Hours 04 Hours 1 2 1 2 1 2 1 1 1 1 1 1 1
Applied Yoga for elementary education: Perelevel. Specific guidelines and Yoga practiceYoga and physical development: Mind-b practices and Benefits.Specific guidelines and Yoga practices forCourse Outcomes: At the end of the course1.Understand a brief history of the d2.Know important practices and print3.Explain how Yoga is important for4.Practice meditation to improveme5.Have knowledge about specific guidelinesCourse Outcomes Mapping with PrograCourse OutcomesCourse OutcomesCourse OutcomesCourse OutcomesCO1CO2CO3CO4CO51: Low 2: Medium 3: High	- Flexib se studen levelopr nciples or n healthy nt of con iidelines m Outc	Concern UN editation oility, Sta nt will b ment of V of Yoga y living ncentrat s of yoga comes & 2 3	Arration de NTT - III n, Yogasa amina, En e able to Yoga ion etc. a practices PSO 4 5 4 5	elopmen nas and m durance (6 7 1 2 3 2	heir types Surya Nan 8 9 1 1 1 1 2 2 2 2	development . Different Yoga naskara) 10 11 10 11 10 3 3 3 3 3 3 3	04 Hours 05 Hours 04 Hours 04 Hours

ТЕХТВ	OOKS:
1.	B.K.S. Iyengar, "Light on Yoga: The Classic Guide to Yoga by the World's Foremost Authority", Thorsons
	publisher 2116.
2.	MakarandMadhukar Gore, "Anatomy and Physiology of Yogic Practices: Understanding of the Yogic Concepts
	and Physiological Mechanism of the Yogic Practices", MotilalBanarsidass Publishers; 6 edition (2116).
3.	Swami SatyanandaSaraswati, "Asana, Pranayama, Mudra and Bandha: 1", Yoga Publications Trust.
REFER	ENCE 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	s / MOOCs/ NPTEL
1.	https://onlinecourses.swayam2.ac.in/aic19_ed29/preview
2.	https://youtu.be/FMf3bPS5wDs

	OVERVIEW O	F INDIAN CUL	TURE AND ART	
Cou	urse Code	21HU8X70	Course Type OEC	C
Tea	ching Hours/Week (L:T:P: S)	3:0:0:0	Credits 03	
Tot	al Teaching Hours	39+0+0	CIE + SEE Marks 50+5	50
	Teaching	g Department: H	lumanities	·
Cour	rse Learning Objectives:			
1.	To understand the relevance of Culture in Hu	ıman Life, dynam	ism of Indian Culture and Arts through ages	8.
2.	To understand the local culture and its vibran	icies.		
3.	To develop awareness about Indian Society, G	Culture and Arts u	Inder Western rule.	
4.	To comprehend different dimension and aspe	ects of the Indian	culture and arts.	
5.	To appreciate cultural performances in India.			
Knov What Influ Relat	wing Culture t is Culture, Different aspects of Culture, Cultu ence of Culture tionship of Culture with: Language, Religion as	ral expression, In	nportance of Culture	7
		UNIT - II		,
Med	ia and Culture			
Role	of News Papers, Indian Cinema, Music, Adver	rtisements		7
Lang Role Budd Suba	guages, Literature and Culture of Sanskrit, Vedas, Upanishads, Ramayan lhist and Jain Literature, Dravidian Language ltern Literature	a and Mahabha es and Literature.	rata, Puranas, other Sanskrit Literature, , North Indian Languages and Literature,	7

	UNIT - III							
Arts a Indian	nd Culture Theatre and Performing Arts, Ritual performances, and Tuluva cultural and ritual performances.	7						
(Self-s Contr Ancies and A as a C Medie Bhakt Moder Nation	study Component) ibution of Indian History to Culture nt India – Persian and Macedonian invasions and its impact on Indian Culture, Development of Culture rts during the Mauryan Empire (Ashoka), the Guptas, the South Indian Dynasties – the Cholas, Nalanda entre of Learning. val India – Life of People under Delhi Sultanate, Rise of Islam and Sufism, Political Scene of India, i Movement, Folk Arts, Rise of Modern Indian Languages. rn India – British Ruling and its impact on Indian Culture, Social and Religious Reforms, Indian hal Movement and Achievement of Independence.	4						
Cours	e 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 h general awareness on historical perspective of growth of Indian Culture and Arts.	nave a						
3.	Know about the impact of Western Rule in India and Indian Struggle for Freedom and also its impact of Culture and Arts and able to appreciate and the role of language in connecting people, growth of cult arts beyond the barriers of religion and ages.	n Indian ture and						
4.	Take interest in learning these forms of arts, and also appreciate and preserve them for the future generative feeling proud of Indian Culture, Arts and Architecture.	tions						

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.

Co	course Outcomes Mapping with Program Outcomes & PSO														
	Program Outcomes →	1	2	3	4	5	6	7	8	9	10	11	12	PS	0 ↓
	↓ 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														

PRINCI	PLES TO PHYSICAL ED	UCATION	
Course Code	21HU8X71	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

- 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)

UNIT – II

Concept of Health - Meaning of Health, Health Definition, Factors Affecting Health, Qualities of Healthy Person. Health Hazards of College Students, Physical Fitness and Exercises.

Food and Nutrition -Food & Nutrition Defined, Nutrients and their Functions - i) Proteins ii) Carbohydrates iii) Fats iv) Vitamins

Balanced Diet & Malnutrition

Health Education - Meaning of Health Education, Health Education Defined, Scope of Health Education, Importance of Health Education.

Posture - Concept of Posture, Correct Postures, Common Postural Defects

First Aid - First Aid Defined, Need and importance of First Aid, The Requisites of FirstAid, Scope of FirstAid, Qualities of a First Aider, Fundamental Principles to be followed and the Duties to be performed by the First Aider, First Aid in Different Cases.

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

Teaching Aid in Physical Education

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

12 Hours

UNIT – III

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

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

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

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

16 Hours

Course Outcomes:

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

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

Co	Course Outcomes Mapping with Program Outcomes & PSO															
	Program Outcomes \rightarrow	1	2	3	4	5	6	7	8	9	10	11	12	PS	O↓	
	↓ 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"

	INTRO	DUC	TIO	N TO	JAP	ANE	SE I	LAN	GUA	GE					
Cou	ırse Code			21H	U 8X7 2	2	(Cour	se Ty	ре				OEC	2
Tea	ching Hours/Week (L:T:P: S)			3:0:0):0		(Credi	its	-				03	
Tot	al Teaching Hours			39+0	+0			CIE -	+ SE	E Ma	rks			50+5	0
100														0010	Ů
G	Teaching Department:														
Cou	se Objectives:	1 • 11													
1.	Have basic spoken communication s	kills													
2.	Write Simple Sentences		okon	Ionor	2000										
3. 1	Read and understand basic Japanese	se sp	oken	Japa	Iding	Kanii	i								
	Read and understand basic sapanese	cnar		men	Jung	Kanji									
				U	NIT -	I									
(Less	sons 1-6)		Ŧ	D		D			D						
Gran	nmar – Introduction, Alphabets, Acce	nts, I	Noun	, Pror	ioun,	Prese	nt T	ense,	Past	tense	CI.				13
v oca	Dunary – Numbers, Days, week days,	mon	tns, S	easor	ns, ina	iture,	Dial	ogs a	ind v	ideo	Cups				15
(T				U	NIT -	Ш									
(Less	$\mathbf{Sons} \ \mathbf{7-13}$	• · · · ·	0												
Loh	munication skills – 1 ime, Addective, S $W/1$ H Entering School/Compared	beaso	ons, C	onve:	rsatioi	n, Qð	ZA Dotui	os ot	~						13
11000	y, 5- w/1-11, Entering School/Compar	іу, Бо	Juyr	arts,	Colou	115, 13	zatul	es eu	~•						
				UN	JIT - 1	m									
(Less	sons 14-21)			U	11 - 1										
Japar	bese Counting System, Birth/Death, D	ialog	s (Go	oing to	o Party	v. Re	stauı	ant).	Mv	lav. S	Succes	ss/Fai	lure. k	Canii	
Char	acters, and sentence making, Video Cl	ips	. (8		,,		,,						j-	13
		•													
Сош	rse Outcomes: At the end of the cours	e stu	dent	will h	e able	to									
1.	Understand Simple words, expressi	ons a	nd se	entenc	ces. sp	oken	slov	vlv a	nd di	stinct	v				
2.	Speak slowly and distinctly to com	orehe	nd		 , sp	onen	. 510	, i y u	ila al	June L	.,				
3.	Read and Understand common wor	ds an	d sen	tence	s										
4.	Ask Basic questions and speak in si	mple	sent	ences											
5.	Write Hiragana/Katakana and Kanj	i (12)	l) cha	aracte	rs.										
G				0	DCO										
Cour	rse Outcomes Mapping with Program	n Ot	itcon	nes &	: PSO	~		7		0	10	11	10	DC	
	Program Outcomes→	1	2	3	4	5	6	1	8	9	10	11	12	1	
							3			2	1		1	1	2
				<u> </u>			3			$\frac{2}{2}$	1		1		
	<u> </u>				$\left \right $		3			2	1	+	1		<u> </u>
	<u> </u>						3			2	1		1		
	CO5						3			2	1	1	1		
	1: Low 2: Medium 3: High				1 1				1				_	1	L]

	INTRODUCTI	ON TO GERMAN	LANGUAGE	
Cou	ırse Code	21HU8X74	Course Type	OEC
Tea	ching Hours/Week (L:T:P: S)	3:0:0:0	Credits	03
Tot	al Teaching Hours	39+0+0	CIE + SEE Marks	50+50
	Teaching	g Department: Mee	chanical	
Cour	se Objectives:			
1. 2. 3. 4. 5.	Distinguish - definite and indefinite articles, of them to differentiate between subjects, object usage. Differentiate between nomnative and akkusat Kein/e/er Differentiate use of dative object besides the of use of personal pronoun as a substitute for Differentiate preposition forms when used ex two cases Differentiate conjugation of verbs in present, verbs, application of conjugation of modal verbs duction: Mein Name ist (saying who you are,	declension of singu ts and indirect object tive cases with trans subject for some sp noun as per the cas clusively in akkusa present-perfect and erbs and position of UNIT - I greeting people and	lar and plural nouns by adding certa cts and construct sentences of simple sitive and intransitive verbs, and neg ecific verbs and Apply the gramma se, number and gender of the noun. tive or Dative forms or on combina l past participle tenses, separable an modal verb in a sentence.	in endings to le day to day gation with r principles tion of the id inseparable
they Natic Wocl Mir g come Wies and v Artik the Die v Dekl: (Dekl (Dekl (Dekl (Dekl (Dekl (Dekl (Gerr and g Nom The v only intrar (Nom Nega (Sing The r to pu Peter (Pete (With	come from and where they live. Language onalitaeten und Spachen, Die Uhrzeit (The tim he, die Monate, die vierJahreszeiten, die Jahre gehtes gut: Asking people how they are, saying from, Language points: verb endings), chreibt man das (how do you write that?) Couvords, talking about us and them. Language po el (Articles): As in English, there are definite (der/die/das; a/an dein/eine rierFälle (The four cases): Nominativ, Akkusati ination des bestimmtenArtikels der/die/das ination des unbestimmtenArtikels der/die/das ination Joeclension: the variation of the form of number, and gender are identified) ination von Substantiven (Declension of nouns) man nouns are declined by attaching certain end gender. This helps to differentiate between subj inativ und Akkusativ(nominative and accusativ verb determines the case of the noun. Some ver with the accusative (or the dative). Thus, Germ nsitive. ninative and accusative cases) Intransitive Verb tion "kein/e/er "(negation with "kein/e/er ") gular und Plural) negation of the indefinite article (ein/eine/ein) in t a "k" at the beginning of the declined form of siehteinHaus. degation peter siehtkeinHa r sees a house. negation peter siehtkeinHa r sees a house. negation peter siehtkeinHa	point: I and you), ne) telling time and ng how you are, sa unting from 1-100 a ints: Yes-no questic der/die/das) and inc iv, Dativ, Genitiv(N of a noun, pronoun,) (Singular and Plur dings to them, acco fects, objects and in ve cases) bs only go with the nan verbs are either open (intransitive verl s kein/keine/kein. F f ein/eine/ein. aus. e a house.) German to English	Lesen der politischenKarte der V d talking about daily routine, Tage aying which cities and counries pe and above, alphabet, spelling our na ons lefinite (ein/eine) articles: lot in level A-1) or adjective, by which its grammat al) rding to case, number direct objects). nominative, others transitive or bs) Transitive Verben (transitive ve for this, you just have <u>Glossary as applicable</u>)	Welt, e der sople ames ical 13 rbs)
Dativ	v (the dative)	UNIT - II		
(You the su objec	are already familiar with verbs which require a ubject, which is in the nominative case. But the to besides the subject. To identify the dative ob Plural (the plural)	a direct accusative re also some verbs ject you ask "(To) v	object in addition to which require a dative vhom?")	13

There are many different forms of the plural in the German language. Principally, the gender and the ending of the noun determine the plural form. Then, you either attach a plural ending to the noun, change a vowel, or keep the noun as it is in the singular.	
Das Personalpronomen (the personal pronoun) The personal pronoun is a substitute for a noun. Its forms are determined by the case, number and gender of the noun which is to be replaced.	
Die Formen des Personal pronomenimNominativ (The nominative forms of the personal pronoun):	
Präpositionen (prepositions) German prepositions are followed by an object, either in the accusative or the dative case. Some prepositions always take an accusative object, others always a dative object. But there are also prepositions which can be followed by both. In this case, the question "Where(to)?" (] accusative) or "Where?" (] dative) determines the case of the object.	
 PräpositionenmitAkkusativ und Dativ (Prepositions with accusative and dative) 1. PräpositionenmitAkkusativ (prepositions with accusative) 2. PräpositionenmitDativ (prepositions with dative) 3. PräpositionenmitAkkusativoderDativ (prepositions with accusative or dative) 	
(With examples, writing and hearing exercises, and German to English Glossary as applicable)	
UN11 - 111	
Konjugation von VerbenimPräsens (Conjugation of verbs in present tense) Verbs are conjugated by attaching certain endings, depending on the person and number of the subject.	
 Trennbare und untrennbareVerben (separable and inseparable verbs) Verbs with prefixes are dinstinguished between separable and inseparable verbs. The prefix of an inseparable verb must never be separated from the stem. Here the stress is on the stem: be- kommen. The prefix of a separable verb gets separated from the stem when the verb is conjugated. In the infinitive, the stress is on the prefix: an-kommen TrennbareVerben (separable verbs) UntrennbareVerben (inseparable verbs) 	
 Konjugation von VerbenimPerfekt (Conjugation of verbs in present perfect) The present perfect (Perfekt) describes something which happened in the past and is especially used in spoken German. It is formed with the present tense form of "haben" or "sein" and the past participle of the main verb. 1. Die Bildung des Partizips (the formation of the past participle) 2. Die Bildung des Perfektsmit "haben" und "sein" (the formation of the present perfect with "haben" and "sein") 	}
Modalverben (modal verbs) A modal verb is rarely used as a main verb; instead, it usually modifies the main verb. While the main verb remains in the infinitive, the modal verb is conjugated. In German, there are 7 modal verbs: können (can/be able), dürfen (may/be allowed), wollen (want), müssen (must/have to), sollen (shall), mögen (to like), möchten (wish/would like)	
 Konjugation der Modalverben (Conjugation of the modal verbs) Stellung des ModalverbsimSatz 	
(Position of the modal verb within a sentence)	l

Co	urse	e Outcomes: At the end of the cours	e stu	dent	will b	e abl	e 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														
		day usage.														
2.		Differentiate between nomnative and akkusative cases with transitive and intransitive verbs, and negation with														
		Kein/e/er														
3.		Differentiate use of dative object besides the subject for some specific verbs and Apply the grammar principles														
		of use of personal pronoun as a substitute for noun as per the case, number and gender of the noun.														
4.		Differentiate preposition forms when used exclusively in akkusative or Dative forms or on combination of the														
_		two cases						0								
5.		Differentiate conjugation of verb	s 1n	pres	sent,	prese	ent-pe	ertec	t and	i pas	st pa	rticipl	e tens	ses, se	eparat	ble and
		inseparable verbs, application of co	njuga	ation	of m	odal	verbs	and	posit	10n o	I moo	aal vei	rb in a	sente	nce.	
I																
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Co	urse	e Outcomes Mapping with Program	n Ot	itcon	nes &	PSC)									
		Program Outcomes →	1	2	3	4	5	6	7	8	9	10	11	12	PS	O↓
	↓ (Course Outcomes													1	2
ľ		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														
TE	XT.	BOOKS:														
	1.	Ulrich Haessermann, Georg Dietri	ch, C	Christ	ianne	C. G	luent	her, I	Dieth	elm k	Kamii	nski, U	Jlrike	Wood	s and	Hugo
		Zenker, Sprachkurs Deutsch Neus	affur	ıg 1,	Unter	richt	swerl	cfuer	Erwa	chsei	ne, V	erlag l	Moritz	z Diest	terweg	5,
	_	Universitaetsdruckerei H. Stuertz	AG V	Vuerz	zburg	, 198	9									
	2.	Paul Coggle and HeinerSchenke,	leach	1 YOU	irself	Gern	nan (a con	nplete	e cou	rse in	unde	rstand	ıng, sp	beakin	g and
	2	writing), Teach Yourself Books, F		en& s	Stoug	hton	Educ	atior	nal, U	K , 2	101	1.0	1	. 0111		
	э.	Langenscheidt German III 50 Days	5: DO	0K +	CuPa	apero	ack,	www	ama.	2011.1	n, –	I Sept	ember	12111		
DE																
RE	FE	RENCE MATERIALS:														
	1.	Deutsche SprachlehrefürAusländer	•													
	2.	ThemenAktuell (Text and workbo	ook).													
	3.	Deutsch alsFremdsprache 1A.														
	4.	Tangram Aktuell 1A/1B (Text and	lwor	kboo	k).											
	5.	Wherever required the Videos/Au	dios a	are al	so pla	ayed	in the	clas	s roo	m ses	ssions	3				
		1														
F-I	2 F	OURCES														
17-1	1	https://onlinecourses.nptal.ac.in/pa	c21	hs20	nrow	011/										
	1.	NPTEL-Swayam, German-I by Pr	of. M	lilind	Brah	me	IIT	Mad	lras							
	2.	https://www.traingerman.com/en/	DI 73 -		. 11											
		powered by Sprachinstitut TREFF	PUN	КΓС	Inline	•										

SUST	AINABLE DEVELO	PMENT GOALS	
Course code	21ME8X75	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03
Course Learning Objectives: Sustainable Development Goals is a 21 environmental integrity, economic via provide the knowledge, skills, attitude They address the global challenges v degradation, peace and justice. Learn r be research-led, applied interdisciplid developing societies, and addresses critication The origin, development and idea of History and origins of the Sustainable I methodology and perspectives? How a SDGs and Society: Ensuring resilience In-depth discussion and analysis of goal	116 United Nations off bility and a just socie and values necessar we face, including por nore and take action. inary program that c tical global challenges UNIT - I the SDGs Development Goals. W re they related to the M e and primary needs in ls related to poverty, ho	icially released Agendas for ty for present and future ge y to address sustainable dev verty, inequality, climate ch This SDG program is organi onsiders sustainability in 1 put forth by UN.	Sustainable approach enerations. It aims to elopment challenges. nange, environmental zed in such a way to both developed and their aims, ls? nd education 13 Hours
	UNIT – II		
SDGs and Society: Strengthening Inst In-depth discussion and analysis of goa cities & communities, and peace, justic SDGs and the Economy: Shaping a Su In-depth discussion and analysis of goa infrastructure, inequalities, responsible	itutions for Sustainabili ls related to gender eque e & strong institutions ustainable Economy ls related to work & ec production & consump	ty aality, affordable and clean er onomic growth, industry, inr ption	nergy, sustainable novation & 13 Hours
	UNIT – III		10 110015
SDGs and the Biosphere: Developme In-depth discussion and analysis of goa Realizing the SDGs: Implementation In-depth discussion and analysis of SD technology and the development of col	nt within Planetary Bou ls related to clean wate through Global Partu G 17 which aims to im herence between policio	indaries r, climate, life below water a terships plement the SDGs through p es.	nd life on land artnerships, finance, 13 Hours
<u>Course Outcomes:</u> At the end of the course the student v	vill be able to		

CO 1	Summarize the UN's Sustainable Development Goals and how their aims, methodology and							
	perspectives.							
CO 2	Analyze the major issues affecting sustainable development and how sustainable development can be							
	achieved in practice.							
CO 3	Identify and apply methods for assessing the achievement/possibilities of sustainable development in							
	Nitte gram panchayath.							
CO 4	Evaluate the implications of overuse of resources, population growth and economic growth and							
	sustainability & Explore the challenges the society faces in making transition to renewable resource							
	use							
CO 5	Create skills that will enable students to understand attitudes on individuals, society and their role							
	regarding causes and solutions in the field of sustainable development.							

TEXTBOOKS:

- 1. Sachs, Jeffrey D. The age of sustainable development. Columbia University Press, 2115
- 2. Gagnon, B., Leduc, R., and Savard, L., Sustainable development in engineering: a review of principles and definition of a conceptual framework. Cahier de recherche / Working Paper 08-18, 2108.
- 3. Dalby, Simon, et al. Achieving the Sustainable Development Goals: Global Governance Challenges. Routledge, 2119.
- 4. Sustainability: A Comprehensive Foundation by Tom Thesis and JonathanTomkin, Editors.

REFERENCE BOOKS:

- 1. Elliott, Jennifer. An introduction to sustainable development. Routledge, 2112.
- 2. Day, G.S., and P.J.H. Schoemaker (2111), Innovating in uncertain markets: 10 lessons for green technologies, MIT Sloan Management Review, 52.4: 37-45.

MOOC Resources:

1. https://www.un.org/sustainabledevelopment/poverty/

Course Articulation Matrix

Course Code / Name : 21ME/ SUSTAINABLE DEVELOPMENT GOALS														
Course Outcomes	Program Outcomes (PO)													
(CO)	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
4 T A 17 11														

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

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

WEB TECHNOLOGIES							
Course Code	21IS8X76	CIE Marks	50				
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50				
Total Hours	39	Credits	03				

Course Learning Objectives (CLOs):

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

- Illustrate the Semantic Structure of HTML and CSS
- Compose forms and tables using HTML and CSS
- Design Client-Side programs using JavaScript and Server-Side programs using PHP
- Illustrate the Database connectivity using PHP
- Examine JavaScript frameworks such as jQuery

UNIT - I

Introduction to HTML- Html tags and simple HTML forms, web site structure, HTML table, Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colours and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.

15 Hours

UNIT - II

Client side Scripting: Introduction to JavaScript: JavaScript language – declaring variables, scope of variables functions, event handlers (on click, on submit etc.), Document Object Model, Form validations. Introduction to PHP: Declaring variables, data types, arrays, strings, operations, expressions, control structures, functions, Reading data from web form controls like Text Boxes, radio buttons, lists etc.,
UNIT – III

PHP Databases: Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, File Handling in PHP, PHP Arrays and Superglobals, Arrays, \$_GET and \$_POST Superglobal Arrays, jQuery Introduction: What is jQuery, Adding jQuery in to your web pages, jQuery Syntax, jQuery Selectors, jQuery Events.

9 Hours

Course Outcomes:

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C8X52.1	Adapt HTML and CSS syntax and semantics to build web pages	L2
C8X52.2	Construct and visually format tables and forms using HTML and CSS	L3
C8X52.3	Experiment with the usage of Event handling and Form validation using Java script	L3
C8X52.4	Understand the principles of object oriented development using PHP and Database concepts	L2
C8X52.5	Inspect JavaScript frameworks like jQuery whichfacilitates developer to focus on core features.	L2

	Table: Mapping of COs to PIs, POs and BTL													
Course Outcomes (COs)	Program Outcomes (POs) Addressed	Performance Indicators (PI)	Bloom's Taxonomy Level (BTL)											
CO1	1,3	1.3.1,1.4.1,3.2.1,	L2											
CO2	1,2,3	1.4.1,3.2.1,3.2.2,2.1.1,2.2.4,3.1.6	L3											
CO3	1,3	1.4.1,3.2.1,3.2.2,3.4.3	L3											
CO4	1,2,3	1.4.1,3.2.1,3.2.2,2.1.1,2.2.4,3.1.6	L2											
CO5	1,3	1.4.1,3.2.1,3.2.2	L2											

Mapping Course Outcomes with Programme Outcomes:

POs	PO	PSO	PSO											
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C8X52.1	1	2		2								1	2	
C8X52.2	1			2								1	2	
C8X52.3	1	2		2	3							1	2	
C8X52.4	1	2		2	3							1	2	
C8X52.5	1			2	3							1	2	

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

TEXTBOOK:

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

E RESOURCES:

1. nptel.ac.in/courses/106105084/11

SEE Question Paper Pattern:

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

1	PROGRAMMING IN JAVA		
Course Code	21CS8X77	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This course will enable students to:

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

UNIT – I

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

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

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

15 Hours

UNIT – II

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

Multi-Threaded Programming:

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

15 Hours

UNIT – III

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

Swings:

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

Course Outcomes:

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

- 1. Apply the object-oriented concepts to solve real world problems using JAVA programming features
- 2. Illustrate the basic constructs and object orients features of the Java language
- **3.** Design a multi-threaded program using Java with exception handling
- 4. Develop Java programs that includes packages and interfaces and preform file operations in Java
- **5.** Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings

09 Hours

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

Graduate Attributes (GA)

This course will map the following GA as per NBA:

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

TEXTBOOK:

1. Herbert Scheldt, Java the Complete Reference, 7th Edition, Tata McGraw Hill, 2107. (Chapters 2-11, 22-24, 29,30)

REFERENCE BOOKS:

- 1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education, 2108, ISBN:9788131721806
- 2. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with Java, Tata McGraw Hill education private limited.
- 3. Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning.
- 4. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.

E-Books / Online Resources:

- 1. Online course material by Oracle :
 - http://docs.oracle.com/javase/tutorial/index.html
- 2. https://www.udemy.com/courses/search/?q=java&price=price-free&view=grid

MOOC:

- 1. Oracle: <u>www.oracle.com/events/global/en/java.../java-a-beginners-guide-1721064.pdf</u>
- 2. <u>NPTEL:</u>www.nptelvideos.com/java/java_video_lectures_tutorials.php

SEE SCHEME:

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

DATA STRUCTURES AND ALGORITHMS													
Course Code	Course Code21CS8X78CIE Marks50												
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50										
Total Hours39Credits03													

Course Learning Objectives:

This course will enable students to:

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

UNIT – I

INTRODUCTION:

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

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

LINEAR DATA STRUCTURES - STACKS:

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

LINEAR DATA STRUCTURES – QUEUES:

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

15 Hours

UNIT – II

LINEAR DATA STRUCTURES - SINGLY LINKED LISTS:

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

LINEAR DATA STRUCTURES - DOUBLY LINKED LISTS:

Doubly Linked List: Representation. (Operations not included). NONLINEAR DATA STRUCTURES – BINARY TREES:

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

INTRODUCTION TO ALGORITHMS:

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

FUNDAMENTALS OF THE ALGORITHMS EFFICIENCY:

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

15 Hours

UNIT – III

DECREASE & CONQUER:

Concept of Decrease and Conquer, Graph traversal algorithms - Depth First Search, Breadth First Search. **DYNAMIC PROGRAMMING:**

Concept of Dynamic Programming, Computing a Binomial Coefficient. **GREEDY METHOD:**

Concept of Greedy technique, Prims algorithm. **BACKTRACKING:**

Concept of Backtracking technique, N-Queens problem.

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

3: Substantial (High) 2: Moderate (Medium)

TEXTBOOKS:

- 1. Aaron M. Tenenbaum, Yedidyah Langsam & Moshe J. Augenstein, "Data Structures using C", Pearson Education/PHI, 2106.
- 2. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", 2nd Edition, Pearson Education, 2107.

REFERENCE BOOKS:

- 1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd edition, Universities Press, 2114.
- 2. Seymour Lipschutz, "Data Structures, Schaum's Outlines", Revised 1st edition, McGraw Hill, 2114.
- 3. Thomas H. Cormen, Charles E.Leiserson, Ronal L. Rivest, Clifford Stein, "Introduction to Algorithms", 2nd Edition, PHI, 2106.

MOOCs:

- 1. Introduction to Data Structures by edx , URL: <u>https://www.edx.org/course/</u>
- 2. Advance Data Structures by MIT OCW, URL: <u>https://www.mooclab.club/</u>
- 3. Data Structure by Harvard Extension School, URL: http://www.extension.harvard.
- 4. http://nptel.ac.in/courses/106101060/

SEE SCHEME:

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

ELECTRIC VEHICLE TECHNOLOGY

Course Code	21EE8X79	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Eligible Students: For all engineering stream except E&E Engineering

Course Learning Objectives:

- 1. To Understand the fundamental laws and vehicle mechanics.
- 2. To Understand working of Electric Vehicles and recent trends.
- 3. Ability to analyze different power converter topology used for electric vehicle application.
- 4. Ability to develop the electric propulsion unit and its control for application of electric vehicles.

UNIT – I

Vehicle Mechanics: Roadway Fundamentals, Laws of Motion, Vehicle Kinetics, Dynamics of Vehicle Motion, Propulsion Power, Force-Velocity Characteristics, Maximum Gradability, Velocity and Acceleration, Constant FTR, Level Road, Velocity Profile, Distance Traversed, Tractive Power, Energy Required, Nonconstant FTR, General Acceleration, Propulsion System Design.

Electric and Hybrid Electric Vehicles: Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains. 14 Hours

UNIT – II

Energy storage for EV and HEV: Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Super capacitors.

Electric Propulsion:

EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives. **16 Hours**

UNIT – III

Design of Electric and Hybrid Electric Vehicles: Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor, power rating of engine/generator, design of PPS Parallel Hybrid Electric Drive Train Design: Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, energy storage design.

9 Hours

Course Outcomes:

At the end of the course student will be able to

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

Course Outcomes Mapping with Program Outcomes & PSO													
Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	
↓ Course Outcomes													
21EE8X .1	2	3											
21EE 8X .2	1	2	3										
21EE 8X .3	1	2	3										
21EE 8X .4	1	2	3										
21EE 8X .5	1	2	2										

1: Low 2: Medium 3: High

SEE QUESTION PAPER PATTERN:

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

TEXTBOOKS:

- 1. Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Husain, CRC Press, 2103
- 2. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, M. Ehsani, Y. Gao, S.Gay and Ali Emadi, CRC Press, 2105

REFERENCE BOOKS:

- 1. Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Sheldon S. Williamson, Springer, 2113.
- 2. Modern Electric Vehicle Technology, C.C. Chan and K.T. Chau, OXFORD University, 2101
- 3. Hybrid Electric Vehicles Principles And Applications With Practical Perspectives, Chris Mi, M. Abul Masrur, David Wenzhong Gao, Wiley Publication, 2101

E-Books / MOOC:

- 1. Introduction to Mechanics | Coursera
- 2. NPTEL: Electrical Engineering Introduction to Hybrid and Electric Vehicles
- 3. Electric Vehicles Part 1 Course (nptel.ac.in)
- 4. Hybrid Vehicles (edX) | MOOC List (mooc-list.com)
- 5. NPTEL: Electrical Engineering Introduction to Hybrid and Electric Vehicles
- 6. Electric Cars: Technology | My MOOC (my-mooc.com)

NATIONAL CADET CORPS: ORGANIZATION, FUNCTIONS AND CAPABILITIES

Course Code	21HU8X81	Course Type	OEC									
Teaching Hours/Week (L:T:P:S)	3:0:0:0	Credits	03									
Total Teaching Hours	39+0+0	CIE + SEE Marks	50+50									
Teachin	a Donartmont: Ch	mictry										
Course Learning Objectives:	g Depai tillent. Ch	ennsti y										
Course Dearning Objectives.												
1. To create evolved youth, who will be equipp	ed to contribute in t	he development of the nation.										
2. To train students so as to achieve their physical and mental endurance. To acquire body language of a sm soldier and to inculcate the sense of authority by commanding the treep under him/her												
soldier and to inculcate the sense of authorit	y by commanding t	he troop under him/her.										
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 th	e defense forces and expose learn	ers to military									
ethos / values												
	UNIT – I											
NCC: Aims Objectives and Organization												
NCC General, Aims, Objectives and Organization	of NCC. Duties of N	NCC Cadets, NCC Camps: Types	and									
Conduct. National Integration: Importance and Nec	essity, Unity in Div	ersity.	7									
Dougonality Douglanment												
Self-Awareness, Empathy, Critical and Creativ	ve Thinking, Deci	sion Making and Problem So	olving.									
Communication Skills, Coping with stress and er	notions. Leadership	p: Traits, Indicators, motivation,	moral 7									
values, Honor Code. Social Service and Community	y Development.											
	UNIT – II											
Naval Communication and Seamanship	T		Chart									
work	vavigation: Navigati	on of Ships- Basic requirements,	Chart 8									
Seamanship: Introduction to Anchor work, Rigg	ging Capsule, Boa	t work- Parts of Boat, Boat p	ulling									
instructions, Whaler sailing instructions. Ship Mode	eling.											
Disaster management and environmental awaren	iess isasters Essential	Sarvicas Assistance Civil Dafa	n ce									
organization. Adventure Activities.	isasters, Essentiar	Services, Assistance, Civil Dele	8									
Dos and Don'ts, Fire services and Firefighting, Envi	ironmental Awarene	ess and Conservation.										
	UNII - III											
Naval Orientation												
Naval Orientation- Armed Forces and Navy Capsul	e, EEZ Maritime So	curity & ICG. Border & Coastal	Areas:									
Security setup and Boarder/Coastal management 1 Merchant Navy	in the area. Naval	Orientation: Modes of Entry- IN	, ICG, 9									
Border and Coastal areas: Security Challenges & ro	le of cadets in Bord	er management										

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. Acquaint, expose & provide knowledge about Army/Navy/ Air force and acquire information about expanse of 3. Armed Forces, service subjects and important battles. **Course Outcomes Mapping with Program Outcomes & PSO Program Outcomes**→ 2 3 4 5 7 8 9 10 11 12 PSOL 1 6 **Course Outcomes** 2 HU1505-1.1 3 3 1

 HU1505-1.2
 3
 3
 1
 1

 HU1505-1.3
 1
 1
 1
 1

 1: Low 2: Medium 3: High
 1
 1
 1
 1

 REFERENCE BOOKS:

 1.
 Cadets Handbook, R.K. Guptha, Ramesh Publishing House, New Delhi.

FUNDAMENTALS OF IMAGE PROCESSING – A PRACTICAL APPROACH												
Course Code	21EC8X82	CIE Marks	50									
Teaching Hours/Week (L:T:P)	2:0:1	SEE Marks	50									
Total Hours	26:0:26	Credits	03									

Course Learning Objectives:

This course will enable the students to

- 1. Understand basic operations on images.
- 2. Understand the concepts of colour models.
- 3. Explain image enhancement techniques.
- 4. Perform morphological operations on images.
- 5. Perform thresholding operation for image segmentation.

Software Tool Required: MATLAB

Image Fundamentals: Description of Image and Basic operations: Image Brightening, Darkening, Addition, Subtraction, Multiplication and logic operations, Binary and Gray scale images, Color Fundamentals.

Image Enhancement Techniques: Concept & Importance of Histogram, Basic gray level transformations, Histogram processing, Basics of spatial filtering, smoothing spatial filters, sharpening filters.

Morphological Operations and Thresholding: Introduction, Erosion and Dilation, Opening and Closing, Thresholding, segmentation methods.

26 Hours

List of Experiments:

- 1. Introduction to MATLAB.
- 2. Reading and analyzing images.
- 3. Image Conversions.
- 4. Basic operations on images.
- 5. Basic Arithmetic operations on images- Addition, Subtraction and Multiplication.

- 6. Exploring Image manipulation operations.
- 7. Histogram processing.
- 8. Demonstration of Effects of Filters on images-Smoothing.
- 9. Demonstration of Effects of Filters on images-Sharpening.
- 10. Exploring different color models.
- 11. Demonstration of Morphological Operations.
- 12. Demonstration of thresholding operations.
- 13. Exploring image segmentation methods.

Scheme of SEE

Laboratory based evaluation

Course Outcomes:

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

- 1. Demonstrate the understanding of basic operations on images
- 2. Apply image enhancement methods
- 3. Perform segmentation operation

Mapping of PO's/ PSO's & CO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
CO1	3	-	-	-	3	-	-	1	1	1	1	-	-	-	-	
CO2	3	-	-	-	3	-	-	1	1	1	1	-	-	-	-	
CO3	3	-	-	-	3	-	-	1	1	1	1	-	-	-	-	
3 – High							2 – Medium						1 - Low			

TEXTBOOKS:

- 1. R. C. Gonzalez and R. E Woods, "**Digital Image Processing**", Pearson education (Asia)/Prentice Hall of India, 3rd Edition, 2109.
- 2. R. C. Gonzalez and R. E Woods, "**Digital Image Processing Using MATLAB**", Pearson education (Asia)/Prentice Hall of India, 2nd Edition, 2111.
- 3. 1.S. Jayaraman, S Esskairajan "Digital Image Processing", illustrated, Tata McGraw-Hill Education,2111.

NPTEL/ MOOC Link:

- 1. https://nptel.ac.in/courses/117105135/
- 2. https://nptel.ac.in/courses/117105079

INTRO	DUCTION TO YA	AKSHAGANA	
Course Code	21HU8X86	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning objectives:

The course will enable the students to:

- 1. Gain basic understanding of Thenku Thittu Yakshagana.
- 2. Perform basic movements.
- 3. Understand speech/dialogue, rhythm, Entry and improvisation skills.

UNIT – I

Introduction: Meaning and features, Origin and development, Difference between Thenkuthittu and Badaguthittu yakshagana. A brief introduction to Thenkuthittu Yakshagana. Thalas-Aadi thala, yeka thala, Kore thala and Asta Thala with biditha and mukthya- Practice. Dhingina – Practice.....

14 Hours

UNIT – II

Thalas- Rupaka Thala, Trivide Thala, Jampe thala etc. with biditha and mukthaya. Dhigina – Practice Rangasthala Pravesha steps and Eripada ettugade steps. Revision of all Thalas.

14 Hours

UNIT – III

Yakshagana Prasanga Practice- Abhinaya and presentation.....

11 Hours

Performance: The final part of the course is the performance. A Prasanga will be chosen and taught

to the participants and they will perform the same in front of a live audience.

REFERENCE BOOKS:

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

MARKI	ETING MANAGEN	MENT	
Course Code	21ME8X88	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

- 1. Understand and learn the marketing concepts and their application to profit-oriented and nonprofit oriented organizations.
- 2. Able to apply the marketing concepts to analyze the buying behavior & marketing segments to solve these problems.
- 3. Understand and learn the need for a customer orientation in product pricing & marketing research in the competitive global business environment;
- 4. Able to develop an understanding and acquiring skills in how to successfully design and implement marketing plans and strategies.
- 5. Understand and learn the concept of sales, advertising &distribution of marketing mix and its application in traditional and novel environments characterized by emerging information technologies.

UNIT - I

BASICS

Definition, Marketing Process, Dynamics, Needs, Wants & Demands, Marketing Concepts, Environment, mix, types, philosophies, Selling Vs. Marketing, organization, Industrial Vs. Consumer Marketing, Consumer goods, Industrial goods, Product hierarchy.

8 Hours

BUYING BEHAVIOUR & MARKET SEGMENTATION

Cultural, Demographic factors, Motives, types, Buying decisions, segmentation factors, Demographic, Psychographic & Geographic Segmentation, Process, Patterns.

8 Hours

UNIT - II

PRODUCT PRICING & MARKETING RESEARCH

Objectives, pricing, Decisions and Pricing methods, Pricing Management. Introduction, Uses, process of Marketing Research.

8 Hours

MARKETING PLANNING & STRATEGY FORMULATION

Components of a marketing plan, strategy formulations and the marketing process, implementation, Portfolio analysis, BCG, GEC grids.

8 Hours

UNIT - III

ADVERTISING, SALES PROMOTION & DISTRIBUTION

Characteristics, Impact, goals, types, Sales promotion-Point of Purchase, Unique Selling proposition.

Characteristics, Wholesaling, Retailing, channel design, logistics, Modern Trends inretailing.

7 Hours

At the end	d of the course the student will be able to
CO1	Explain the basic marketing concepts
CO 2	Interpret the buying behaviour of customers and role of marketing segments
CO3	Explain the role of product pricing and marketing research in the competitive global business environment
CO4	Analyse the marketing plans and strategies.
CO5	Explain the role of sales, advertising and distribution in marketing to achieve the goals of marketing

TEXTBOOK:

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

REFERENCE BOOKS:

- 1. Philip Kolter, "Marketing Management: Analysis, Planning, Implementation and Control ", 1998.
- 2. Green Paul.E. and Donald Tull, " Research for Marketing Decisions ", 1975.
- **3.** Ramaswamy.V.S. and S.Namakumari, "Marketing Environment: Planning, Implementation and Control the Indian Context ", 1990
- 4. Jean Plerre Jannet Hubert D Hennessey Global Marketing Strategies.