DEPARTMENT OF CIVIL ENGINEERING

VIMAL JYOTHI ENGINEERING COLLEGE

CHEMPERI, KANNUR-670632

COURSE HAND BOOK

(2019 SCHEME)

SEMESTER 4

2019 Admission

Prepared by

Dr. Biju Mathew

2021

DEPARTMENT OF CIVIL ENGINEERING

Department of Civil Engineering was established in the year 2010. The department offers AICTE approved undergraduate programme in Civil Engineering and post graduate programme in Structural Engineering and Construction Management. The Department is accredited by NBA (National Board of Accreditation).

The department has been imparting quality education to meet the technological advancement and industrial requirements. The department has well-equipped labs in all disciplines which gratify to the need of the undergraduate and postgraduate students. Universal Testing machines, UV Spectrophotometer, 200 T Compressive Testing Machine, Constant heat B. O. D. Incubators are few instruments .Besides imparting classroom training, the department has the policy of organizing technical visits and expert talk to give exposure to the practical field. Adequate training is provided to our students for getting placements in various companies. Fields in which the faculty is specialized are Structural Engineering, Earthquake Engineering, Geotechnical , Hydrology, Water Resources, Foundation Engineering, Construction Management, Environmental , Remote sensing etc.

The Civil Engineering Department administers a Civil Engineering program that will produce graduates who are ready to work, high in quality, skilled in information technology and are professional in nature. The department also strives to undertake a program in community service and to disseminate advanced technical knowledge to engineers, other professionals and the public.

VISION OF THE COLLEGE

To bloom into a Center of Excellence for Technical Education and a pace-setter in rural India with its quality processes and procedures, interwoven with freedom of flexibility, moulding professionals of superior quality, dedicated to the progress and development of Humanity.

MISION OF THE COLLEGE

To prepare the students to see beyond geographical limit and belong to a new age of acquisition and application of technology to meet the challenges of the changing world. Inspired and guided by gospel values, we contribute to the socioeconomic welfare of the country with due concern to the marginalized.

QUALITY POLICY

VJEC is committed to provide quality education in engineering and technology, to transform the youth into committed technical personal for the social and economical well being of the nation with integral development of the personality and character building.

MOTTO OF THE COLLEGE

"Where Perfection is the Tradition"

VISION OF THE DEPARTMENT

To develop into a center of excellence for quality education moulding competent civil engineering professionals dedicated to the progress and development of humanity

MISION OF THE DEPARTMENT

- ❖ To provide quality education and training to create competent civil engineers
- ❖ To interact with industries to provide a knowledge base for existing and emerging technologies in the field of civil engineering.
- ❖ To inculcate moral and ethical values among the students to mould them as civil engineers with social obligations

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

- Graduates will achieve broad and in-depth knowledge of Civil Engineering relating to industrial practices and research to analyze the practical problems and think creatively to generate innovative solutions using appropriate technologies.

- Graduates will make valid judgment, synthesize information from a range of sources and communicate them in sound ways appropriate to their discipline.

- Graduates will sustain intellectual curiosity and pursue lifelong learning not only in areas that are relevant to Civil engineering, but also that are important to society.

- Graduates will adapt to different roles and demonstrate leaderships in global working environment by respecting diversity, professionalism and ethical practices.

PROGRAM SPECIFIC OUTCOME (PSOS)

- Graduates will have the ability to design a civil engineering system or process to meet the desired needs of the society.

- Graduates will have the ability to design and conduct experiments in various areas of civil engineering as well as analyze and interpret data.

PROGRAMME OUTCOMES

1) **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering Fundamentals, and an engineering specialization to the solution of complex engineering problems.

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

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

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

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

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

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

8) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineeringpractice.

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

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

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

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

Time Table

S4 CE A
Vimal Jyothi Engineering College, Chemperi, Kannur Dist., Kerala

	1 (8:30 - 9:10)	2 (9:20 - 10:00)	3 (10:10 - 10:50)	4 (11:00 - 11:40)	5 (11:50 - 12:30)	6 (12:40 - 13:20)
Mo	CEL202 MATERIAL TESTING LAB– I/CEL204 FLUID MECHANICS LAB			EST200 DESIGN & ENGINEERING	MAT202 PROBABILITY STATISTICS AND NUMERICAL METHODS	CET204 GEOTECHNICAL ENGINEERING – I
	Ms. Hridya P / Ms. Sigi Thomas / Mr.Ryne P M / Mr. Rameshan K P			Mr.Linjesh Sebastian	Ms. Vineethamol Abraham	Mr Rojin P
Tu	CET204 GEOTECHNICAL ENGINEERING – I	CET202 ENGINEERING GEOLOGY	CET202 ENGINEERING GEOLOGY PRACTICAL	MAT202 PROBABILITY STATISTICS AND NUMERICAL METHODS TUT	EST200 DESIGN & ENGINEERING	CET206 TRANSPORTATION ENGINEERING
	Mr Rojin P	Ms. Athira Rajendran	Ms. Athira Rajendran	Ms. Vineethamol Abraham	Mr.Linjesh Sebastian	Ms.Maqsooda J H S
We	MAT202 PROBABILITY STATISTICS AND NUMERICAL METHODS	CET204 GEOTECHNICAL ENGINEERING – I	CET206 TRANSPORTATION ENGINEERING	CEL202 MATERIAL TESTING LAB– I/CEL204 FLUID MECHANICS LAB		
	Ms. Vineethamol Abraham	Mr Rojin P	Ms.Maqsooda J H S	Ms. Hridya P / Ms. Sigi Thomas / Mr.Ryne P M / Mr. Rameshan K P		
Th	MAT202 PROBABILITY STATISTICS AND NUMERICAL METHODS	CET202 ENGINEERING GEOLOGY	CET206 TRANSPORTATION ENGINEERING	CET204 GEOTECHNICAL ENGINEERING – I	Minor/Honors	
	Ms. Vineethamol Abraham	Ms. Athira Rajendran	Ms.Maqsooda J H S	Mr Rojin P		Ms. INDU T
Fr	EST200 DESIGN & ENGINEERING	MCN202 CONSTITUTION OF INDIA	CET202 ENGINEERING GEOLOGY	CET206 TRANSPORTATION ENGINEERING	Minor/Honors	
	Mr.Linjesh Sebastian	Ms. VINAYA S M	Ms. Athira Rajendran	Ms.Maqsooda J H S		Ms. INDU T
Sa	EST200 DESIGN & ENGINEERING	CET202 ENGINEERING GEOLOGY	MAT202 PROBABILITY STATISTICS AND NUMERICAL METHODS	MCN202 CONSTITUTION OF INDIA	CET204 GEOTECHNICAL ENGINEERING – I	CET206 TRANSPORTATION ENGINEERING
	Mr.Linjesh Sebastian	Ms. Athira Rajendran	Ms. Vineethamol Abraham	Ms. VINAYA S M	Mr Rojin P	Ms.Maqsooda J H S

Timetable generated:4/25/2021   aSc Timetables

S4 CE B
Vimal Jyothi Engineering College, Chemperi, Kannur Dist., Kerala

	1 (8:30 - 9:10)	2 (9:20 - 10:00)	3 (10:10 - 10:50)	4 (11:00 - 11:40)	5 (11:50 - 12:30)	6 (12:40 - 13:20)
Mo	MCN202 CONSTITUTION OF INDIA	CET202 ENGINEERING GEOLOGY PRACTICAL	CET206 TRANSPORTATION ENGINEERING	CET204 GEOTECHNICAL ENGINEERING – I	MAT 202 PROBABILITY STATISTICS AND NUMERICAL METHODS TUT	CET202 ENGINEERING GEOLOGY
	Dr.Vra Saathappan	Ms. Margaret Abraham	Ms. VINAYA S M	Ms. Hridya P	Ms. Siji P	Ms. Margaret Abraham
Tu	CET204 GEOTECHNICAL ENGINEERING – I	CET202 ENGINEERING GEOLOGY	CET206 TRANSPORTATION ENGINEERING	MAT202 PROBABILITY STATISTICS AND NUMERICAL METHODS	CET204 GEOTECHNICAL ENGINEERING – I	EST200 DESIGN & ENGINEERING
	Ms. Hridya P	Ms. Margaret Abraham	Ms. VINAYA S M	Ms. Siji P	Ms. Hridya P	Mr. Logi.N.Boby
We	MAT202 PROBABILITY STATISTICS AND NUMERICAL METHODS	EST200 DESIGN & ENGINEERING	MCN202 CONSTITUTION OF INDIA	CET202 ENGINEERING GEOLOGY	CET206 TRANSPORTATION ENGINEERING	CET206 TRANSPORTATION ENGINEERING
	Ms. Siji P	Mr. Logi.N.Boby	Dr.Vra Saathappan	Ms. Margaret Abraham	Ms. VINAYA S M	Ms. VINAYA S M
Th	CEL202 MATERIAL TESTING LAB– I/CEL204 FLUID MECHANICS LAB			EST200 DESIGN & ENGINEERING	Minor/Honors	
	Mr Ashwin Joy / Mr Rojin P / Mr. Aji Augustine / Mr. Dilin Dinesh			Mr. Logi.N.Boby		Ms. Rinnet Francis
Fr	CEL202 MATERIAL TESTING LAB– I/CEL204 FLUID MECHANICS LAB			MAT202 PROBABILITY STATISTICS AND NUMERICAL METHODS	Minor/Honors	
	Mr Ashwin Joy / Mr Rojin P / Mr. Aji Augustine / Mr. Dilin Dinesh			Ms. Siji P		Ms. Rinnet Francis
Sa	MAT202 PROBABILITY STATISTICS AND NUMERICAL METHODS	CET206 TRANSPORTATION ENGINEERING	CET204 GEOTECHNICAL ENGINEERING – I	CET202 ENGINEERING GEOLOGY	EST200 DESIGN & ENGINEERING	CET204 GEOTECHNICAL ENGINEERING – I
	Ms. Siji P	Ms. VINAYA S M	Ms. Hridya P	Ms. Margaret Abraham	Mr. Logi.N.Boby	Ms. Hridya P

Timetable generated:4/25/2021   aSc Timetables

ASSESSMENT PLAN 2020-21 EVEN SEMESTER

ASSESSMENT PLAN 2020-2021, S4 CE A&B (2019-2023 Batch)

Subject Name	Name of Faculty (A)	Name of Faculty (B)	Assignment No.	Issue Date	Submission Date	Return Date
Probability, statistics and numerical methods	Ms. Vineethamol Abraham	Ms. Siji P	1	24/05/21	31/05/21	10/06/21
			2	25/06/21	05/07/21	15/07/21
Engineering geology	Ms. Athira Rajendran	Ms. Margaret Abraham	1	01/06/21	10/06/21	21/06/21
			2	06/07/21	16/07/21	27/07/21
Geotechnical engineering – i	Mr. Rojin P	Ms. Hridya P	1	29/05/21	07/06/21	18/06/21
			2	03/07/21	13/07/21	26/07/21
Transportation engineering	Ms Maqsooda J H S	Ms. Vinaya S M	1	09/06/21	18/06/21	21/06/21
			2	12/07/21	21/07/21	31/07/21
Design & engineering	Mr. Linjesh Sebastian	Mr. Logi N Boby	1	07/06/21	15/06/21	18/06/21
			2	09/07/21	19/07/21	28/07/21
Constitution of India	Ms. Vinaya S M	Dr. VRA Sathappan	1	19/05/21	28/05/21	07/06/21
			2	22/06/21	02/07/21	12/07/21

Internal Exam	Proposed Date	Result Analysis
First Internal Exam	22nd, 23rd and 24th June 21	5-Jul-21
Second Internal Exam	12"th. 13"th and 14"th July21	23 - July-21
Final Internal mark publishing	11August 21	

Class/course committee/advisory meeting	Proposed Date
Course Team meeting	22nd and 23rd April 21
Advisory committee meeting 1	May 19
Advisory committee meeting 2	25 June 21
Advisory committee meeting 3	27 July 21

Class commencement	26-04-21
Class ends	11-08-21
Contact class	22-07-21 to 11-08-21

Mentors List

CLASS/ BATCH	ROLL NO.	NAME OF TUTOR	PHONE NO.	EMAIL ID
S3/S4 CE-A (2019-23)	01-27	Mr.Linjesh Sebastian	8547881882	linjesh@vjec.ac.in
	28-53	Ms.Rinnet Francis	9497420192	rinnet@vjec.ac.in
S3/S4 CE-B (2019-23)	01-27	Ms.Hridya P	9496641477	hridyap94@vjec.ac.in
	28-54	Ms.Margaret Abraham	9633466204	margaret@vjec.ac.in
HOD		Dr Biju Mathew	9847436426	hodce@vjec.ac.in

	Register Number	Name	Blood Group
	S4 CE A		
	Register Number	**Name**	**Blood Group**
1	VML19CE002	ABDUL MALICK P C	A+ve
2	VML19CE004	ABHINAV P M	A+ve
3	VML19CE006	ABISHEK	O+ve
4	VML19CE008	ADARSH V V	O+ve
5	VML19CE010	ADITHYA RAJ B P	O+ve
6	VML19CE012	AJU JOSEPH K	B+ve
7	VML19CE014	AKHILA M	O+ve
8	VML19CE016	ALAN RONALD REJI	AB+ve
9	VML19CE018	AMAL P.V	A+ve
10	VML19CE020	ANAGHA MOHAN N V	B+ve
11	VML19CE022	ANANDHU P V	O+ve
12	VML19CE024	Anaswara A Nambiar	O+ve
13	VML19CE028	ANTUS SUNNY	A+ve
14	VML19CE030	ANURA BALAKRISHNAN	B+ve
15	VML19CE032	APARNA RAMESH	O+ve
16	VML19CE034	ARYA SOMAN K	O+ve
17	VML19CE035	ARYASREE RAMACHANDRAN	A+ve
18	VML19CE037	ASWATHI T P	AB+ve
19	VML19CE039	ASWITH P SASIDHARAN	O+ve
20	VML19CE040	Athira Ramesh N.V	B+ve
21	VML19CE042	CHANDHANA K	O-ve
22	VML19CE043	DAYAL K	O+ve
23	VML19CE045	DHEERAJ HARIDAS	O+ve
24	VML19CE047	DHEERAJ SUNITH	O+ve
25	VML19CE049	FARHANA C V	AB+ve
26	VML19CE051	FRINTO ANTONY	A+ve
27	VML19CE053	GOKULNATH M	O+ve
28	VML19CE055	HRUTIKA M R	B+ve
29	VML19CE057	JOHN MATHEW	B+ve
30	VML19CE059	KARTHIK	O+ve
31	VML19CE060	K N ROHITH	O+ve
32	VML19CE062	KRISHNENDH K V	O+ve
33	VML19CE063	LAKSHMI NIVEDITHA	O+ve
34	VML19CE065	MALAVIKA K JITHENDRAN	O+ve
35	VML19CE067	MEGHNA ANISH C	B+ve
36	VML19CE070	MUHAMMED HADIL HARSHAN K P	B+ve
37	VML19CE071	MUHAMMED RAZEEL A K	O+ve
38	VML19CE073	NEHA SASEENDRAN	A+ve
39	VML19CE075	NITHIN JOSE	O+ve
40	VML19CE077	PRANAV E.P	A+ve
41	VML19CE079	RITHIN T RAMESH	A+ve
42	VML19CE081	SAHLA CHOOTTACHI PUTHIYAPURAYIL	O+ve
43	VML19CE083	SANDHRA MADHUKUMAR	B+ve
44	VML19CE087	SANKEERTHANA M	B+ve
45	VML19CE089	SAYOOJ	O+ve
46	VML19CE090	SIMNA DAS P	A+ve
47	VML19CE091	SNEHA SEBASTIAN	B+ve
48	VML19CE093	SONU SUBHASH P V	O-ve
49	VML19CE097	THEERTHA SURENDRAN K V	B-ve
50	VML19CE099	TREESA WILSON	O+ve
51	VML19CE101	VARSHA K	AB+ve
52	VML19CE103	VISHNU M V	O+ve
53	VML19CE104	VISMAYA MOHAN K	O+ve

	S4 CEB		
	Register Number	**Name**	**Blood Group**
1	VML19CE001	AARYA K	B+ve
2	VML19CE003	ABHIJITH JAYAN	O+ve
3	VML19CE005	ABHIRAM J M	O+ve
4	VML19CE007	ADARSH M	AB+ve
5	VML19CE009	ADITHYA KRISHNA S	A+ve
6	VML19CE011	AISWARYA P K	AB+ve
7	VML19CE013	AKARSH M	B+ve
8	VML19CE015	AKSHAY P	A+ve
9	VML19CE017	AMAL JOSE	AB+ve
10	VML19CE019	Anagha K P	O-ve
11	VML19CE021	ANAGHA PREMARAJAN V	B+ve
12	VML19CE023	ANANYA DINESHAN	AB+ve
13	VML19CE025	ANSAF C P	O+ve
14	VML19CE026	ANSHA KURIAN	O+ve
15	VML19CE027	ANTO RONALD REJI	AB+ve
16	VML19CE029	ANUPRIYA A	O+ve
17	VML19CE031	ANUSREE RAMACHANDRAN	A+ve
18	VML19CE033	AROMAL S	O-ve
19	VML19CE036	ASWATHI ANIL	O+ve
20	VML19CE038	ASWINI P	O+ve
21	VML19CE041	BEN JACOB FRANCIS	B+ve
22	VML19CE044	DAYA S RAM	O+ve
23	VML19CE046	DHEERAJ MOHAN	B+ve
24	VML19CE048	DWITHIN DILEEP	O+ve
25	VML19CE050	FIDA HAMEED	A+ve
26	VML19CE052	GAYATHRI N	B+ve
27	VML19CE054	HARITHA K V	O+ve
28	VML19CE056	JISHNU SANTH	B+ve
29	VML19CE058	JOSEPH GEORGE	O-ve
30	VML19CE061	KRISHNA PRIYA C	A+ve
31	VML19CE064	LAYA NARAYANAN	A+ve
32	VML19CE066	MEGHA K	O+ve
33	VML19CE068	MIDHUJA JAYAKUMAR KUNNOOL	B+ve
34	VML19CE069	MUHAMMAD RASY P C	B+ve
35	VML19CE072	NANDANA P	B+ve
36	VML19CE074	NILA K P	A+ve
37	VML19CE076	PAVITHRA T A	B-ve
38	VML19CE078	RAZEEN MOOSA V	O+ve
39	VML19CE080	RIYA JOSE	AB+ve
40	VML19CE082	SAI KRISHNA T O	B+ve
41	VML19CE084	SANDRA N	AB+ve
42	VML19CE085	SANGEETH KRISHNA N V	O+ve
43	VML19CE086	SANJU N SUSHAR	B+ve
44	VML19CE088	SARANG C H	B+ve
45	VML19CE092	SONISHA K	B+ve
46	VML19CE094	SREELAKSHMI E	B+ve
47	VML19CE095	SREESHMA GOVINDAN	B+ve
48	VML19CE096	THANWI RAJEEV	B+ve
49	VML19CE098	TINA RAVINDRAN V	A+ve
50	VML19CE100	VAISHNAVI SURESH	B+ve
51	VML19CE102	VISHNU DINESHAN	O+ve
52	VML19CE105	YADHUKRISHNAN K R	A+ve
53	VML19CE106	ZAIDAN AZAD	O+ve

SALIENT FEATURES & RULES AND REGULATIONS
2019 ADMISSION

- The duration of the B.Tech. Program shall be 4 years (8 semesters).
- The maximum duration shall be six academic years spanning 12 semesters.
- Every academic year shall have two semesters "1st July to 31st December (Odd semester)" and "1st January to 30th June (Even semester)".
- Each semester shall have minimum of 72 working days.
- B.Tech. Program shall have a total of 160 academic credits and 2 additional pass/fail credits.
- There shall be End Semester Examinations (ESE) in every semester for all courses as prescribed under the respective curriculum, except the Lab/ workshops courses for 1 & 2 semester"s .The End Semester Examinations shall be conducted by the University.
- Candidates in each semester shall be evaluated both by Continuous Internal Evaluation (CIE) and End Semester Examinations (ESE). The ratio of Continuous Internal Evaluation (CIE) to End Semester Examinations (ESE) shall be:

  Theory Courses : 1 : 2   Laboratory Courses : 1 : 1

  Project : CIE only   Seminar : CIE only

- The main eligibility criteria for registering to the End Semester Examination are 75% attendance in the course and no pending disciplinary action. Students who do not meet these eligibility criteria are awarded an FE grade.
- The students with FE grade shall register for the courses during the normal semesters in which the courses are offered.
- A student who does not register for all the courses listed in the curriculum for a semester shall not be eligible to enroll for the next higher semester.
- A student who does not register for all the courses listed in the curriculum for a semester shall not be eligible to enroll for the next higher semester.
- The maximum number of credits a student can register (course registration) for, in a semester is limited to 08 credits in excess of the total mandatory credits allotted in the curriculum for that semester.
- Students registered for a course have to attend the course regularly and undergo the Continuous Internal Evaluation (CIE) and appear for the End Semester Examinations (ESE). Credits for the course are deemed to be earned only on getting at least a pass grade „P" or better in the composite evaluation.
- Pass minimum for a course shall be 40% for the End Semester Examination and 50% of CIE and ESA put together. Letter grade „F" will be awarded to the student for a course if either his/her mark for the End Semester Examination (ESE) is below 40 % or the overall mark [Continuous Internal Evaluation (CIE) + End Semester Examination (ESE)] is below 50 %.
- Students who received F grade in an End Semester Examination shall have to appear for the End Semester Examination at the next opportunity and earn the credits. They shall not be permitted to register for the course again
- Continuous Internal Evaluation mark percentage shall not exceed 30% over the End Semester Examination mark %. CIE marks awarded to a student shall be normalized accordingly. For example if the end semester mark % is 40, then the maximum eligible CIE mark % is 40+30 = 70 %.).
- Minimum Cumulative Credit Requirements for Registering to Higher Semesters

  5"th semester - 21 Credits from S1& S2

  7"th semester - 47 Credits from S1 to S4 , 09 Credits from S3 to S4 for lateral entry

  - There is no provision for improving the grade. However, the student is permitted to check the answer books of the End Semester Examination after the results are declared, on payment of the prescribed fee.The students can apply for revaluation

examination after the results are declared. The final mark awarded will be the better of the two marks.

- Grade cards shall be made available in the student login for the registered courses, in every semester. On earning the required credits for the degree, the University will issue the final consolidated grade sheet for the B. Tech program including CGPA.

- A student shall earn 2 credits by actively involving in co – curricular and extra – curricular activities as per the guidelines issued by the University from time to time.

- On getting minimum 100 activity points the student passes the course and earns the two credits which shall not be counted for the calculation of CGPA but mandatory for the award of the Degree. For the students admitted under lateral entry scheme the 2 credits shall be considered to be earned on getting 75 activity points. The students are required to keep a file containing documentary proofs of activities done by him/her attested by the Senior Faculty Advisor/ Faculty Advisor.

- Students are expected to attain 100% attendance for all courses. However, under unavoidable circumstances they are permitted to avail leave. Total leave of absence shall not exceed 25% of the academic contact hours for a course .On medical ground the college Principal can relax the minimum attendance requirement to 60%, to write the end semester examination. This is permitted for one or more courses registered in the semester. Principal shall keep all records which led to his decision on attendance, for verification by the Academic Auditors/ University officials. This provision is applicable only to any two semesters during the entire program period.

- The Principals are authorized to grant attendance relaxation (duty leave) to the students in officially sponsored national level competitions/championships/ tournaments when called upon to do so, up to a maximum of 10%. Such students should produce the participation certificate countersigned by the University Sports Coordinator/ the Director of Physical Education in the case of sports activities and the Senior Faculty Advisor in the case of other extracurricular activities: within ten days of the event. The participation certificate thus produced shall be forwarded to the Principal with the due recommendation of the respective Head of the Department. Under any circumstances, the principal shall not consider the certificate if the overall attendance of the candidate is less than 60%. Late applications received shall not be considered on any account. The student shall get official prior permission from the University for representing the University.

- The Principals are authorized to grant attendance relaxation (duty leave) to the students for organizing extra/ co-curricular activities, up to a maximum of 05%. Such students should produce the required documents countersigned by the University Sports Coordinator/ the Director of Physical Education in the case of sports activities and the Senior Faculty Advisor in the case of other extra/ co-curricular activities: within ten days of the events. The documents thus produced shall be forwarded to the Principal with the due recommendation of the respective Head of the Department. Under any circumstances, the principal shall not consider the documents, if the overall attendance of the candidate is less than 60%. Late applications received shall not be considered on any account.

- ***Honours***
  - ✓ *Honours is an additional credential a student may earn if s/he opts for the extra 20 credits needed for this in her/his own discipline. KTU is providing this option for academically extra brilliant students to acquire Honours. Honours is intended for a student to gain expertise/specialize in an area inside his/her major B.Tech discipline and to enrich knowledge in emerging/advanced areas in the branch of engineering concerned.*
  - ✓ *On successful accumulation of credits at the end of the programme, this will be*

mentioned in the Degree Certificate as "Bachelor of Technology in xxx, with Honours." The fact will also be reflected in the consolidated grade card, along with the list of courses taken.

✓ The courses shall be grouped into maximum of 3 groups, each group representing a particular specialization in the branch. The students shall select only the courses from same group in all semesters. It means that the specialization is to be fixed by the student and cannot be changed subsequently.

✓ The internal evaluation, examination and grading shall be exactly as for other mandatory courses. Out of the 20 Credits, 12 credits shall be earned by undergoing a minimum of three courses listed in the curriculum for honours, of which one course shall be a mini project based on the chosen area. The remaining 8 credits could be acquired by undergoing 2 MOOCs

✓ There won't be any supplementary examination for the courses chosen for honours.

- *Minors*
  ✓ Minor is an additional credential a student may earn if s/he does 20 credits worth of additional learning in a discipline other than her/his major discipline of B.Tech. degree.

  ✓ The objective is to permit a student to customize their Engineering degree to suit their specific interests. Upon completion of an Engineering Minor, a student will be better equipped to perform interdisciplinary research and will be better employable. Engineering Minors allow a student to gain interdisciplinary experience and exposure to concepts and perspectives that may not be a part of their major degree programs.

  ✓ S/he accumulates credits by registering for the required courses, and if the requirements for a particular minor are met within the time limit for the course, the minor will be awarded. This will be mentioned in the Degree Certificate as "Bachelor of Technology in xxx with Minor in yyy". The fact will also be reflected in the consolidated grade card, along with the list of courses taken.

  ✓ Out of the 20 Credits, 12 credits shall be earned by undergoing a minimum of three courses listed in the curriculum for minor, of which one course shall be a mini project based on the chosen area. They can do mini project either in S7 or in S8.

  ✓ There won't be any supplementary examination for the courses chosen for honours.

Student Activity Points.
Apart from technical knowledge and skills, to be successful as professionals, students should have excellent soft skills, leadership qualities and team spirit. They should have entrepreneurial capabilities and societal commitment. In order to nurture these qualities, KTU has introduced activity points to be earned by the students during their academic stay at the University covering extra-curricular and co- curricular activities. All students have to earn a minimum of 100 activity points from various activity segments listed to qualify for the B.Tech degree. Two credits are given for this on a pass/ fail basis and is mandatory for getting the B.Tech Degree. As no grade is given for these two credits, they are not included in the CGPA calculation. For lateral entry students joining from the third semester, the activity point requirement is 75.

CAMPUS CODE OF CONDUCT

1. Students are expected to maintain the highest standards of discipline and dignified manner of behavior inside as well as outside the College campus. They shall abide by the rules and regulations of the College and should act in a way that highlights the discipline and esteem of the College.

2. All the students are expected to be seated in the class room/lab 5 minutes before the commencement of the class/lab. The first hour will begin with a prayer song which will be played through P.A System. The students shall stand in attention till the prayer ends. Those who are standing outside the classroom are also expected to follow this.

3. As per the suggestions of the PTA meeting (16.01.17) the following measures to be implemented to discourage the students from repeating the above.
   - Late comers will be marked as absent in the class
   - For all the offenses mentioned above, first time oral warning will be given and for the second instance written warning will be given with a copy to the parent and on the third instance the parents to come to the college to discuss with the tutor and HoD about the ways and means to correct the student. However if the student is not coming with the parent/guardian within one month from the notice or if the student repeats the same offense again, he/she will be suspended from the college.

4. Students shall rise from their seats when the teacher enters the class room and shall remain standing till the teacher takes her/his seat or they are allowed to sit.

5. No student shall enter or leave the class room when the session is on without the permission of the teacher concerned.

6. Students having lab sessions in the FN or AN, have to report to the lab directly in time and they are not expected to go to the class room.

7. Students can leave the campus during class hours only after getting a gate pass from the Principal/ HoD, or the tutor and after making entry in the Gate Register maintained by the gate keeper.

8. All students shall leave the classes immediately after the last hour. Students are not to stay back in the class room/lab beyond normal working hours unless there is special permission/special class.

9. No students shall wander or gather in verandah, corridor, and staircase etc. Canteen, coffee shop, stationary store and bank to be visited only during intervals and non-working hours. Unauthorized absence from the class will attract disciplinary action.

10. All leave applications (Regular & Medical) shall be submitted in time, for sanction by HoD and concerned teachers. Application for medical leave shall be accompanied by valid medical certificates.

11. Students shall come to the college in the prescribed uniform. Besides those who are in laboratories shall wear their respective lab-coats and safety shoes. Students travelling in the college bus shall be in uniform during the entire duration of travel.

12. All the students are expected to attend all college functions in college uniform unless otherwise specified.

13. All the students shall wear their identity cards, well displayed. Identity card is a public document and any teaching staff and non-teaching staff shall have the right to peruse it. Denial of that alone invites disciplinary action.

14. Students planning to make pilgrimage to Sabarimala can avail relaxation in dress code by producing a letter of intention certified by their parent/guardian. The student will be issued with a permission token to be kept along with the ID card to be shown to the authorities on demand during the period of dress code relaxation. However in labs as

per safety regulations the prescribed uniforms shall be worn.

15. All kinds of tattooing, body piercing, hair styling and costumes that goes against the existing social norms and which could go against the spirit of VJEC academic values will be referred to the discipline committee.

16. As per Government rules, students (both day- scholars & hostlers) are not permitted to use vehicles in the College Campus. Day-scholars shall park their vehicles in the designated places near the entrances.

17. Students are expected to maintain silence in the academic buildings. Any deviant behaviour such as hooting, whistling, loitering etc. will be treated as an instance of indiscipline.

18. For independent study, students are expected to use the class rooms, library or the demarcated areas of the academic building and shall not resort to sitting in staircases or circulation areas where they could interfere with the free movement.

19. Students are encouraged to make use of the library, common computing facilities and to involve in professional body activities or any program authorized by the college beyond class hours. However under normal circumstances students shall retreat to their hostels or residences by 6.00PM.

20. All the students are advised to follow the VJEC Mobile phone policy and bring to the notice of the authorities violations if any.

21. Keep the campus neat and clean. Do not put any waste anywhere in the campus except in the waste baskets kept.

22. All the class rooms shall be kept neat and tidy, personal belongings such as shoes and lab coats shall not be stored in the class rooms.

23. Consumption of intoxicants / psychotropic substances in any form or smoking or using chewing- gum, panmasala etc. are strictly prohibited.

24. It is strongly advised to refrain from activities such as scribbling or noting on walls, door or furniture which could deface the college and destroy the academic ambiance.

25. Carefully handle the furniture, equipment, fixtures and appliances of the college and lab. Careless handling/misuse of the above could result in personal injuries or damage to property Follow safety precautions near moving machines and electrical installations. In the event of damage of property, the responsible students will have to bear the cost of replacement/repair.

26. Students are not permitted to arrange any unauthorized celebrations and decorations of any magnitude in the campus.

27. Students are not permitted to distribute or display (both physically and electronically) material such as notices, banners etc. in the campus without the permission of the competent authority.

28. Students who intend to represent the college in intercollegiate events shall take prior permission from the concerned head of the department and the selection will be based on parameters such as academic performance, attendance, character, existing academic pressure and competence of the student in the proposed event for participation.

29. During internal examinations of 2 hour duration, students are not allowed to leave the hall within one hour from the beginning of the exam, and students have to occupy the seat 5 minutes before the commencement of the examination.

30. Appearing in all the internal examinations is mandatory for all the students.

31. Political activity in any form is not permitted in the College campus. Unauthorized meetings, propaganda work, processions or fund collections are forbidden within the College, hostels, and outside the college.

32. Harassing juniors, ill treating fellow students or any form of ragging is prohibited and liable to be treated as a criminal offence by the law enforcing agencies as per the directives of Hon'ble Supreme Court of India

LIST OF STAFF AND CONTACT DETAILS

	List of Staff and Contact details		
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SYLLABUS

Course Code	Course Name	L-T-P	Credits	Exam Slot
	Semester 4			
MAT202	Probability, Statistics And Numerical Methods	3-1-0	4	A
CET202	ENGINEERING GEOLOGY	3-0-1	4	B
CET204	GEOTECHNICAL ENGINEERING – I	4-0-0	4	C
CET206	TRANSPORTATION ENGINEERING	4-0-0	4	D
EST200	DESIGN & ENGINEERING	2-0-0	2	E
MCN202	CONSTITUTION OF INDIA	2-0-0	Nil	F
CEL202	MATERIAL TESTING LAB– I	0-0-3	2	S
CEL204	FLUID MECHANICS LAB	0-0-3	2	T
VAC	Minor course	3-1-0	4	M
CET294	PAVEMENT CONSTRUCTION AND MANAGEMENT	3-1-0	4	H

1. PROBABILITY, STATISTICS AND NUMERICAL METHODS

Module	Details	Hours
I	**Discreteprobabilitydistributions** Discrete random variables and their probability distributions, Expectation, mean and variance, Binomial distribution, Poisson distribution, Poisson approximation to the binomial distribution, Discrete bivariate distributions, marginal distributions, Independent random variables, Expectation -multiple randomvariables.	9
II	**Continuousprobabilitydistributions** Continuous random variables and their probability distributions, Expectation, mean and variance, Uniform, exponential and normal distributions, Continuous bivariate distributions, marginal distributions, Independent random variables, Expectation-multiple random variables, i.i.d random variables and Central limit theorem	9
III	**Statisticalinference** Population and samples, Sampling distribution of the mean and proportion (for large samples only), Confidence interval for single mean and single proportions(for large samples only). Test of hypotheses: Large sample test for single mean and single proportion, equality of means and equality of proportions of two populations, small sample t-tests for single mean of normal population, equality of means (**only pooled t-test, for independent samples from two normal populations with equal variance**	9
IV	**Numerical methods –I**	9

	Errors in numerical computation-round-off, truncation and relative error, Solution of equations – Newton-Raphson method and Regula-Falsi method. Interpolation-finite differences, Newton"s forward and backward difference method, Newton"s divided difference method and Lagrange"s method. Numerical integration-Trapezoidal rule and Simpson"s 1/3rd rule (**Proof or derivation of the formulae not required for any of the methods in thismodule**)	
V	**Numerical methods –II** Solution of linear systems-Gauss-Siedal and Jacobi iteration methods. Curve fitting-method of least squares, fitting staright lines and parabolas. Solution of ordinary differential equations-Euler and Classical Runge-Kutta method of second and fourth order, Adams-Moulton predictor-correction method (**Proof or derivation of the formulae not required for any of the methods in this module**)	9

COURSE OBJECTIVES

- This course introduces students to the modern theory of probability and statistics, covering important models of random variables and techniques of parameter estimation and hypothesis testing

- A brief course in numerical methods familiarizes students with some basic numerical techniques for finding roots of equations, evaluating definite integrals solving systems of linear equations, and solving ordinary differential equations which are especially useful when analytical solutions are hard to find.

COURSE OUTCOMES

After Completing the course, the students should be able to :	
CO1	Understand the concept, properties and important models of discrete random variables and, using them, analyse suitable random phenomena
CO2	Understand the concept, properties and important models of continuous random variables and, using them, analyse suitable random phenomena
CO3	Perform statistical inferences concerning characteristics of a population based on attributes of samples drawn from the population
CO4	Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numericaltechniques
CO5	Apply standard numerical techniques for solving systems of equations, fitting Curves on given numerical data and solving ordinary differential equations.

CO-PO MAPPING OF MAT 202

CO	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2

CO.1	3	2	2	2	2	-	-	-	-	2	-	1	-	-
CO.2	3	2	2	2	2	-	-	-	-	2	-	1	-	-
CO.3	3	2	2	2	2	-	-	-	-	2	-	1	-	-
CO.4	3	2	2	2	2	-	-	-	-	2	-	1	-	-
CO5	3	2	2	2	2	-	-	-	-	2	-	1	-	-

Note
1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)*"-"no correlation*

QUESTION BANK-module 1

1.Let X be a discrete random variable with mean 10 and variance 25.Find the positive values

of α and β such that $\square$ = $\square\square$ − $\square$ has mean 0 and variance 1.

(3)

2.Derive mean and variance of Poisson distribution   (7)

3.Out of 2000 families with 4 children each,how many would you expect to have
i) at least one boy
ii) at most one boy   (8)

4.Suppose that the probabilities are 0.4,0.3,0.2 and 0.1 that there will be 0,1,2,or 3 power
failures in a certain city during ihe month of July.Find the mean and variance of this
probability distribution   (3)

5.In a given city 6% of all drivers get at least one parking ticket per year.Use the Poisson
approximation to binomial distribution to determine the probabilities that among 80 drivers
(randomly chosen in the city)
i)4 will get at least one parking ticket in any given year
ii)at least 3 will get at least one parking ticket in any given year
iii)anywhere from 3 to 6 inclusive, will get at least one parking ticket in any given year
(8)

6. During one stage in the manufacture of integrated circuit chips , a coating must be
applied.If 70% of chips receive a thick enough coating .Use binomial distribution to find the
probabilities that,among 15 chips
i) at least 12 will have thick enough coating
ii) at most 6 will have thick enough coating
iii) exactly 10 will have thick enough coating   (7)

7. If the sum of the mean and variance of a binomial distribution for 5 trials is 1.8. Find the
probability distribution function   (3)

8.A random variable takes the values -3,-2,-1,0,1,2,3 such that P(X=0)=P(X>0)=P(X<0) and
P(X=-3)=P(X=-1)=P(X=2)=P(X=3).Obtain probability distribution function
(7)

9.It is known that 2% of the accounts in a company are delinquent.If 5 accounts are selected
at random,compute the following probabilities
i)atmost 2 accounts will be delinquent
ii)atmost 4 accounts will be delinquent   (8)

10.Let X be a random variable taking values -1,0 and 1 such that P(X=-1)=2P(X=0)=P(X=1)
I)Find pdf of X
ii)Find tha mean of (2X-5)   (7)

11.A pair of dice is thrown in 5 times.If getting a doublet is considered to be success , use
Binomial distribution to find the probability of getting
i)atleast two successes

ii)atmost two successes

iii)exactly two failures
12.Show that Poisson distribution is limiting case of Binomial distribution as (8)

$n \to \infty, p \to 0$ (7)

13.A coin is biased so that the head is twice as likely to appear as the tail. The coin is tossed twice. Find the expected value of the number of heads. Also find the variance of number of heads.   (8)

14.Fit a poison distribution to the following data

X	0	1	2	3	4	5
Fi	142	156	69	27	5	1

15. A gardener sows 4 seeds in each of 100 plant pots. The number of pots in which 0,1,2,3 and 4 of seeds germinated is given in the following table. Fit a binomial distribution to the data

No.of seeds germinate	0	1	2	3	4
No. of pots	13	35	34	15	3

(8)

16. If the random variable X takes the values 1,2,3 and 4 such that 2P(X=1)=3P(X=2)=P(X=3)=5P(X=4), find the probability distribution and cumulative distribution function of X   (3)

17. A complex electronic system is built with a certain number of backup components in itssubsystems. One subsystem has four identical components, each with a probability of 0.2 offailing in less than 1000 hours. The subsystem will operate if any two of the four componentsare operating. Assume that the components operate independently. Find the probability that
i)exactly two of the four components last longer than 1000 hours.
ii)the subsystem operates longer than 1000 hours.   (7)

18.
The probability of an item produced by a certain machine will be defective is 1.5.   If the produced items are sent to the market in packets of 20, find the number of packets containing
   (i)   atleast 2
   (ii)   (ii) exactly 2
   (iii)   (ii) atmost 2 defective items in a consignment of 1000 packets using
              Poisson distribution
       (8)

QUESTION BANK-module 2

1. Derive mean and variance of uniform distribution. (3)
2. The time required to assemble a piece of machinery is a random variable having approximately a normal distribution with mean12.9 minutes and standard deviation 2.0minutes. What are the probabilities that the assembly of a piece of machinery of this kind will take
(i) at least 11.5 minutes;
(ii) anywhere from 11.0 to 14.8 minutes?   (8)
3. If the distribution function of a random variable is given by

$$F(x) = \begin{cases} 1 - \dfrac{1}{x^2}, & x > 1 \\ 0, & x \leq 1 \end{cases}$$

find the probabilities that this random variable will take on a value
   (i)   less than 3;
   (ii) between 4 and 5.   (7)

4. Find the value of k and hence find the mean and variance of the distribution

$$f(x) = kx^2 x^{-x}, 0 < x < \infty \qquad (3)$$

5.If X is uniformly distributed over (-α,α) , α<0. Find α so that
 (i) P(x>1) = 1/3
(ii) P(|x|<1) = P(|x|>1)   (7)

6. 5% of the observation in a normal distribution are below 5 and 25% of the observations are between 5 and 25. Find mean and SD   (3)

 7. Derive the mean, variance and distribution function of the uniform distribution in the interval (a,b).   (7)

  8.The amount of time that a surveillance camera will run without having to be reset is a random variable having the exponential distribution with mean 50 days Find the probability that such a camera will
(i) have to be reset in less than 20 days
(ii) not have to be reset in at least 60 days
(iii) have to be reset between 20 and 60 days.
(8)

 9.The time required to microwave a bag of popcorn using the automatic settin can be treated as a random variable having a normal distribution with standard deviation 10 seconds. If the probability is 0.8212 that the bag will take less tha 282.5 seconds to pop, find the probability that it will take longer than 258.3 seconds to pop   (7)

10. In a Normal Distribution, if 6% of the items are below 60 and 39% are abo 70, then find the mean and standard deviation.

11. If X follows a uniform distribution in (-2, 2), then

(i) find $P[|x - 1| \leq 2]$

(ii) find k for which $P[x > k] = 1/3$
(iii) Distribution function   (8)

12. If a continuous random variable has the probability distribution function

$$F(x) = \begin{cases} kx^{-3x} & , x > 0 \\ 0 & , x \leq 0 \end{cases}$$

then find (i) value of k

   (ii) $P[0 \leq x \leq 2]$

   (iii)   (iii) $P[x > 1.5]$ (7)
   (iv)

13The length of time (in minutes) a person speaks over the phone follows an exponential distribution with mean 4. Find the probability that the person will talk for
   (i)   more than 8 minutes

14. The marks obtained by students in an intelligence test follow normal distribution with mean 45 and standard deviation 25. Find the percentage of students who scored marks
    (i) more than 80
    (ii) between 30 and 70
    (iv)   below 35   (7)

15. The time required to repair a machine is exponentially distributed with param What ½. What is the probability that
   i)repair time exceeds 2 hrs
  (ii) repair time is between 3 hrs and 5 hrs?   (8)

16. In an intelligence test administrated on 1000 children, the average was 60 an standard deviation was 20. Assuming that the marks obtained by the children fol normal distribution, find the number of children who have scored
(i) above 90 marks
(ii) below 40 marks
(iii) between 50 and 80 marks   (7)

17.
 The probability mass function of a random variable X is given below

X	0	1	2	3
F(X)	C	$2C^2$	C^2	$3C^2$

QUESTION BANK(Module 3)
1. In a random sample of 500 people selected from the population of a city 60 were found to be left-handed. Find a 95% confidence interval for the proportion of left-handed people in the city   population.
   (3 marks)
2. What are the types of errors involved in statistical hypothesis testing. Explain the level of risks associated with each type of error.
   (3 marks)
3. A soft drink maker claims that a majority of adults prefer its leading beverage over that of its main competitor‟s. To test this claim 500 randomly selected people were given the two beverages in random order to taste. Among them, 270 preferred the soft drink maker‟s brand, 211 preferred the competitor‟s brand, and 19 could not make up their minds. Determine whether there is sufficient evidence, at the 5% level of significance, to support the soft drink maker‟s claim against the default that the population is evenly split in its preference.
   (7 marks)
4. A nutritionist is interested in whether two proposed diets, diet A and diet B work equally well in providing weight-loss for customers. In order to assess a difference between the two diets, she puts 50 customers on diet A and 60 other customers on diet B for two weeks. Those on the former had weight losses with an average of 11 pounds and a standard deviation of 3 pounds, while those on the latter lost an average of 8 pounds with a standard deviation of 2 pounds. Do the diets differ in terms of their weight loss?(7 mark

5. The mean blood pressure of 100 randomly selected persons from a target population is 12.73 units.Find a 95% confidence interval for the mean blood pressure of the population   (7 marks)
6. The CEO of a large electric utility claims that 80 percent of his 1,000,000 customers are very satisfied with the service they receive. To test this claim, the local news paper surveyed 100 customers, using simple random sampling. Among the sampled customers, 73 percent say they are very satisfied.Based on these findings, do you think that the CEO is making a false claim of high satisfaction levels among his customers? Use a 0.05 level of significance.
(7 marks)
7. A magazine reported the results of a telephone poll of 800 adult citizens of a country. The question posted was "should the tax on cigarettes are raised to pay for health care reform?". The results of the survey were: Out of the 800 persons surveyed, 605 were non-smokers out of which 351 answered "yes" and the rest "no". Out of the remaining 195, who were smokers, 41 answered "yes" and the remaining "no". Is there sufficient evidence , at the .05 significance level, to conclude that the two population smokers and non-smokers differ significantly with respect to their opinions?   (7 marks)
8. Two types of cars are compared for acceleration rate.40 test runs are recorded for each car and the results for the mean elapsed time recorded below:

	Sample mean	Sample standard deviation
Car A	7.4	1.5
Car B	7.1	1.8

   Determine if there is a difference in the mean elapsed times of the two car models at 95% confidence level   (7 marks)
9. The 95% confidence interval for the mean mass(in grams) of tablets produced by a machine is (0.56,0.57), as calculated from a random sample of 50 tablets. What do you understand from this statement ?   (3 marks)
10. The mean volume of liquid in bottles of lemonade should be at least 2 litres. A sample of bottles is taken in order to test whether the mean volume has fallen below 2 litres. Give a null and alternate hypothesis for this test and specify whether the test would be one-tailed or two- tailed.   (7 marks)
11. The mean yield of wheat from district A has 210 kg with SD 10kg per acre from a sample of 100 plots. In another district B, the mean yield was 200 kg with SD 12kg per acre from a sample of 150 plots. Assuming that SD of yield in the entire state was 11kg test whether there is any significant difference between mean yield of wheat in 2 district.(7 marks)
12. The mean life of 100 light tubes produced by a company is computed to be 1570hr.The company claims that the average life of the tubes produced by them is 1600hr.Using level significance 0.05, Is the claim acceptable?
(7 marks)

QUESTION BANK(Module 5)

1. Apply Gauss-Seidel method to solve the following system of equations $4x_1 - x_2 - x_3 = 3; -2x_1 + 6x_2 + x_3 = 9; -x_1 + x_2 + 7x_3 = -6$.   (7 marks)
2. Using the method of least squares fit a straight line of the form $y = ax + b$ to the following set of ordered pairs (x, y) : (2,4),(3,5),(5,7),(7,10),(9,15)   (7 marks)
3. Write the normal equations for fitting a curve of the form $y = a_0 + a_1 x^2$ to a given set of pairs of data points.   (3 marks)

4. Use Runge-Kutta method of fourth order to compute $y(0.25)$ and $y(0.5)$, given the initial value problem $y' = x + y^2$, $y(0) = 1$. (7 marks)

5. Using Runge – Kutta Method of 4th order, find $y(0.8)$ correct to four decimal places if $\frac{dy}{dx} = x - y^2$ given $y(0.6) = 1.7379$ (Take $h = 0.1$) (7 marks)

6. Using Euler's Method compute the value of $y(0.1)$ given $y^1 = y + \frac{1}{x}$, $y(0) = 1$ (Take $h = 0.025$) (7 marks)

7. Solve the system of equations using Gauss Seidel iteration method starting with the initial approximation x = y = z = 1. 4x + 5z =12.5; x + 6y + 2z = 18.5; 8x + 2y + z = -11.5 (7)

8. Solve the initial value problem $y' + y \tan x = \sin 2x$, $y(0) = 1$ at x =0.2 using Runge-Kutta method. (7 marks)

9. Using Euler method find y at x = 0.1 and x = 0.2 for the equation $y' = y - 2xy$, $y(0) = 1$. (7 marks)

10. Using Euler's method find y(0.2) and y(0.4) given dy/dx = x + y, y(0) = 1 and h = 0.2 (7 marks)

11. Use the fourth order Runge-Kutta method to find y(0.2) from dy/dx = y - x, y(0) = 2 taking h=0.1 (7 marks)

12. Solve the system of equations 4x + 2y + z = 14, x + 5y – z = 10, x + y + 8z = 20 using Gauss-Seidal iteration method (7 marks)

13. Use the fourth order Runge-Kutta method to find y(0.2) from dy/dx = y - x, y(0) = 2 taking h=0.1 (7 marks)

14. Using Euler's method find y(0.2) and y(0.4) given dy/dx = x + y, y(0) = 1 and h = 0.2 (7 marks)

15. Solve the system of equations 4x + 2y + z = 14, x + 5y – z = 10, x + y + 8z = 20 using Gauss-Seidal iteration method. (7 marks)

16. Use Euler's method with h=.1 ,compute the value of y(0.5) for the equation $y^1 = x + y^2$, $y(0) = 0$ (7 marks)

17. Explain the principle of least squares for determining a line of best fit to a given data

18. Given the initial value problem $y^1 = x + y$, $y(0) = 0$ .Find y(.1) and y(.2) using Euler method (7 marks)

19. The table below gives the estimated population of a country(in millions) for during 1980-1995

Year	1980	1985	1990	1995
Population	227	237	249	262

Plot a graph of this data and fit an appropriate curve to the data using the method of least squares. Hence predict the population for the year 2010.

CET202	ENGINEERING GEOLOGY	Category	L	T	P	Credits
		PCC	3	0	1	4

Preamble: Goal of this course is to introduce to the students the basics of earth processes, materials, groundwater and the geological characteristics of such processes and materials which are relevant to the Civil Engineering applications.

Course **Outcomes**: After completion of the course the student will be able to:

CO1	Recall the fundamental concepts of surface processes, subsurface process, minerals, rocks, groundwater and geological factors in civil engineering constructions.
CO2	Identify and describe the surface processes, subsurface process, earth materials, groundwater and geological factors in civil engineering constructions.
CO3	Apply the basic concepts of surface and subsurface processes, minerals, rocks, groundwater and geological characteristics in civil engineering constructions.
CO4	Analyze and classify geological processes, earth materials and groundwater.
CO5	Evaluation of geological factors in civil engineering constructions.

Mapping of course outcomes with program outcomes (Minimum requirement)

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

MARK DISTRIBUTION
Attendance : 10marks
Continuous Assessment Test (2 numbers) : 25 marks
Assignment/Quiz/Courseproject :15 marks
End Semester Examination : 100Marks

End Semester Examination Pattern:
There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14marks.

Model Question Paper
Course Code: CET 202
ENGINEERING GEOLOGY

Max.Marks: 100   Duration: 3hours
Part A
(Answer all questions; each question carries 3 marks)
1. Define weathering of rocks
2. Explain soil erosion and classification of soils
3. Describe earthquakes and write notes on seismograph and seismogram
4. Illustrate the elastic rebound theory with adiagram
5. Define Ghyben Herzberg relation in sea waterintrusion
6. Explain Darcy's Law with a neat diagram
7. Write down the physical properties and chemical composition of given minerals
   a. Calcite
   b. Gypsum
8. Describe the different types of igneous rocks based on their origin
9. Illustrate the major parts of the fold with a neat diagram
10. Distinguish between clinometer compass and Brunton compass
PART B
(Answer one full question from each module, each question carries 14 marks)
Module -1
11. a) Discuss the relevance of geology in civil engineering constructions (7marks)

b) Give an account on classification of weathering with suitable diagrams and examples (7 marks)

12. Describe the geological work of rivers. Discuss different landform features produced by weathering and river action with suitable diagrams. (14 marks)

Module -2

13. Comment on the relation of earthquakes with plate tectonics. Give an account on different plates with earthquake prone area (14 marks)

14. Discuss the various types of seismic waves and their relevance in the study of internal structure of earth. (14marks)

Module -3

15. Discuss the vertical distribution of groundwater. Give an account of the water bearing properties of rocks and hydrological cycle with neat diagrams. (14marks)

16. a) Elucidate application of electrical resistivity survey in ground water exploration. (8 marks)

b) Give a brief account on different ground water recharge methods (6 marks)

Module -4

17. Distinguish between metamorphic and sedimentary rocks with respect to their structure with diagrams (14marks)

18. a) Elucidate various physical properties of minerals for their identification. (9marks)

b) Give an account on hardness of minerals with Moh"s hardness scale (5 marks)

Module -5

19. a) Enumerate the geological factors to be considered for selecting a dam site (9 marks)

b) Discuss the geological conditions suitable and unsuitable for construction of tunnels (5marks)

20. Distinguish between folds and faults. Give an account on classification of folds with neat diagrams (14 marks)

Syllabus

Module	Contents	Hours
Module 1 External Earth Processes	Relevance of Geology in Civil Engineering, **Surface Processes of the earth**- a) Weathering of rocks-Types of weathering, Processesof Origin of Products of weathering like sand, clay, laterite and soil, soil profile, Soil erosion and soil conservation measures. Engineering significance of weathering. b) Geological processes by rivers. c) Landslides-types, causes and controlling measures, Coastal Processes-Geological work by waves and currents and coastal protection measures	9
Module 2 Internal Earth Processes	**Internal Processes of the earth-** a) Earthquakes- Plate Tectonics, Origin of earthquakes, Seismic waves, Rating of earthquakes, types of earthquakes, Seismic zones of India. Basics of seismic safety factor, Interior of the earth as revealed by propagation of seismic waves.	9
Module 3 Groundwater	**Hydrogeology**-Occurrence of groundwater, aquifers and types of aquifers, confining beds, porosity and vertical distribution of groundwater. Darcy's Law.Permeability/hydraulic conductivity. Problems created by groundwater to civil engineering structures,Methods to control groundwater problems, Electrical resistivity survey for groundwater exploration. Seawater intrusion in Coastal area.Ghyben Herzberg relation.	9

Module 4 Earth Materials	**Mineralogy-**Physical properties of minerals, physical properties and chemical composition of minerals like quartz, orthoclase, plagioclase, biotite, muscovite, hornblende, augite, hypersthene, calcite, gypsum. **Petrology-**Igneous, sedimentary and metamorphic rocks, Igneous rocks-Chemical and mineralogical classification and structure. Sedimentary rocks-types based on mode of formation and structures Metamorphic rocks-structures only. Megascopic study of granite, dolerite, basalt, sandstone, limestone, shale, gneiss, marble and charnockite. Rock types of Kerala. Rockcycle	9
Module 5 Secondary Structures of Rocks	**Structural Geology–** Attitude of rocks – Dip and Strike. Terminology, brief classification and engineering significance of folds, faults and joints. Geological part of site investigation for the construction of dams, reservoirs and tunnels. Toposheet.Structural mapping.Clinometer compass and Brunton compass.	9

QUESTION BANK

MODULE 1
1. What is weathering? (2)
2. Describe the types of weathering and their products. (13)
3. Describe the laboratory tests to assess the intensity of weathering. (8)
4. Discuss the geological classification of soils. (7)
5. Classify landslides (7)
6. Describe various methods used to protect the coastal areas from marine erosion. (7)
7. Write a note on soil conservation measures. (6)
8. Discuss the significance of O and E horizons of soil profile. (7)
9. Examine the role of acids in chemical weathering. (8)
10. Assess beach nourishment and relocation of engineering structures as alternatives to hard methods of coastal protection. (10)
11. Evaluate the negative effects of seawalls and groins as shore protection structures. (10)
12. Appraise the benefits of crop rotation and strip farming as soil conservation strategies.(10)
13. Explain any two laboratory tests used for assessing intensity of weathering. (6)
14. Explain soil profile with neat sketch. (3)
15. List the various sub-divisions in geology (5)
16. Explain soil erosion and its causes. (8)
17. Give brief account of relevance of Geology in civil engineering. (5)
18. What are the causes of landslides? Add a note on their preventive measures. (8)
19. Explain chemical weathering

MODULE 2

1. What is an earthquake? (2)
2. Describe the terms: intensity and magnitude of earthquakes.
3. Write a note on platetectonics. (5)
4. Discuss the disadvantages of intensity as a measure of earthquake strength. (8)
5. Compared to Himalayan region earthquakes are less frequent in Kerala - Elucidate (5)
6. Discuss seismic waves and their properties.
7. Elucidate Lithosphere and Asthenosphere.
   MODULE 3

1. Write notes on different ground water zones. (7)
2. What is an aquifer? Describe the types of aquifers. (8)

3. a) Evaluate the porosity and permeability factors of intact rock and rock masses. (3)
   b) Permeability alone cannot be used to judge the flow of ground water. Discuss. (4)
   c)   How long does it take for water subjected to 10m head difference to pass through a 5mlength of
   i) intact granite which has an isotropic hydraulic conductivity (K) of 1×10^{-12} m/s (2.5)
   ii)fractured sandstone with an isotropic hydraulic conductivity (K) of 1×10^{-4} m/s (2.5)
   d)   From the above two results of time factor of water flow, which among those rocks need care while accomplishing engineering projects affecting subsurface. (3)
4. Explain Artesian aquifer (3)
5. Explain Hydraulic conductivity (3)
6. Describe the methods to control of subsurface water. (9)
7. Differentiate unconfined and confined aquifer with figure. (5)
8. Elucidate on geological classification of soil (5)
9. Explain the properties that affect the strength of minerals (6)
10. Write short note on i) Granite ii) Shale iii) Lime-stone (9)
11. Describe the common methods to control subsurface water (5)
12. Explain (i) Hydraulic conductivity (ii) Artesian condition (10)
13. Describe vertical distribution of ground water
14. Give an account of factors controlling groundwater movement
15. What are artesian wells

MODULE 4

1. Write the distinguishing properties with the chemical composition of the followingminerals.
    a) Orthoclase b) Hornblende c) Kaolinite (5 marks each)
2. How do one differentiate Igneous rocks from Metamorphic rocks (15)
3. Chemical composition alone is insufficient to name a mineral, Discuss. (3)
4. Write a short description on any two properties that are used to identify a mineral species during field work phase. (7)
5. Why colour and streak of minerals are not always identical? (2)
6. Quartz occur less than 10% in majority of crustal rocks. But they form more than 60% ofsand deposition on earth surface. Why? (3)
7. Discuss i) Granite ii) Basalt (5)
8. How do sedimentary rocks differ from metamorphic rocks? (5)
9. Discuss any two major rock species outcropped in the state of Kerala. (5)
10. Explain physical properties of the following: i) Amphibole ii) Pyroxene iii) Mica (15)
11. Write short note on rock types of Kerala.
12. Differentiate igneous, sedimentary and metamorphic rocks. (5)
13. Describe any three physical properties which affect the strength of minerals. (6)
14. Explain: (i) Quartz (ii) Feldspar (iii) Gypsum (9)
15. Give brief account of rock features that affect the strength of rock as constructionmaterial (6)
16. How are igneous and sedimentary rocks differentiated in field (site)?
17. Write short notes on: (i) Granite (ii) Shale (10)
18. Elucidate Classification of rocks based on their origin

MODULE 5

1. Explain a) Rip currents. (7) (b) Joints. (7)
2. Write on the significance of faults in civil engineering. (6)
3. What are the geological factors to be considered in Dam construction? (20)
4. Discuss the origin of folding and faulting of rocks (5)

5. Briefly discuss why the knowledge on rock joints is important for the construction of engineering structures. (5)
6. How do the trends of geological structures decide the location of huge civilianconstructions like dam and reservoirs? (5)
7. Identity the category to which the fold having following geometry falls intoStrike of limb 1 – N60 degrees; Dip of limb 1 – 20 degrees to N 330
Strike of limb 2 – N 240 degrees; Dip of limb 2 – 20 degrees to N 330And draw a cross section of the fold along the limbs (5)
8. Explain the concept of lineation and foliation.
9. What is meant by folds? Explain different types of fold. (6)
10. Describe the classification of fault. (6)
11. Give the engineering significance of faults and joints. (12)
12. What is meant by folds? Explain three different types of fold. (7)
13. How Joints are formed? How do joints differ from fault? (8)
14. The dip amount and dip direction of two outcrop of a contact between limestone and sandstone, located at a distance of 500m apart, are 200^0/$N150^0$ and 210^0 /$N330^0$. Identifythe structure and its strike.
15. Explain: a) Folds b) faults c) their significance in civil engineering d) cleavage e)lineation and foilation
16. Elucidate on Engineering significance of Dip and strike

CET 204	GEOTECHNICAL ENGINEERING - I	CATEGORY	L	T	P	CREDIT
		PCC	4	0	0	4

Preamble: Goal of this course is to expose the students to the fundamental concepts of soil mechanics and laboratory tests to determine the basic, index and engineering properties of soils. After this course, students will be able to identify and classify the soil and to recognize practical problems in real-world situations and respond accordingly.

Course Outcomes: After completion of the course the student will be able to:

CO 1	Explain the fundamental concepts of basic and engineering properties of soil
CO 2	Describe the laboratory testing methods for determining soil parameters
CO 3	Solve the basic properties of soil by applying functional relationships
CO 4	Calculate the engineering properties of soil by applying the laboratory test results and the fundamental concepts of soil mechanics
CO 5	Analyze the soil properties to identify and classify the soil

Mapping of course outcomes with program outcomes (Minimum requirement)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	3	-	-	-	-	-	-	-	-	-	-
CO 4	2	3	-	-	-	-	-	-	-	-	-	-
CO 5	2	3	-	-	-	-	-	-	-	-	-	-

MARK DISTRIBUTION

Attendance	:	10marks
Continuous Assessment Test (2 numbers)	: 25 marks	
Assignment/Quiz/Courseproject	:15 marks	
End Semester Examination	**: 100Marks**	

Model Question Paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: CET 204
Course Name : GEOTECHNICAL ENGINEERING - I

Max. Marks: 100   **Duration: 3 hours**

Part A
(Answer all questions; each question carries 3 marks)

1. Draw a three phase block diagram and define (i) Void Ratio, (ii) Water Content and (iii) Degree of saturation
2. Explain the procedure for Specific Gravity test using Pycnometer.
3. Define (i) Liquid Limit, (ii) Plastic Limit & (iii) Shrinkage Limit
4. Differentiate between Coefficient of Permeability and Coefficient of Percolation.
5. Explain Total Stress, Neutral Stress and Effective Stress.
6. List the assumptions of Boussinesq‟s theory.
7. Define pre consolidation pressure. Explain the method for the estimation of pre consolidation pressure.
8. Differentiate between Consolidation and Compaction.
9. Explain Mohr Coulomb shear strength theory.
10. What are the different types of slope failures?

PART B
(Answer one full question from each module, each question carries 14 marks)

Module – 1

11.
- a) Derive the relation between bulk unit weight, specific gravity, void ratio and degree of saturation from the fundamentals. (5 Marks)
- b) A sample of wet silty clay soil weighs 1.26 kN. The following data were found from lab tests on the sample. Density y = 21 kN/m3, Water content w = 15%, Specific Gravity G = 2.7. Determine (i) Dry density, (ii) Void Ratio, (iii) Porosity (iv) Degree of Saturation,(v) Saturated unit weight (vi) Submerged unit weight and (vii) Volume of soil. (9 Marks)

12.
- a) Explain different types of soil structures. (5 Marks)
- b) 1000 cm3 core cutter weighing 9.46 N was used to find out the in-situ unit weight of soil in an embankment. The weight of core cutter with in-situ soil was noted to be 27.7 N. Laboratory tests on the sample indicated water content of 10% and specific gravity of solids of 2.63. Determine the bulk unit weight, dry unit weight, void ratio and degree of saturation. Also calculate the saturated unit weight and the

corresponding water content if the embankment is saturated during rain without change in volume.　(9 Marks)

Module – 2

13.
    a) What is the use of particle size distribution curve? With the help of particle size distribution curve define the following terms (i) well graded soil (ii) poorly graded soil and (iii) gap graded soil.　(5 Marks)

    b) Tests on a fined grained soil sample indicated the following properties:
Liquid Limit = 52%, Plastic Limit = 32% and Shrinkage Limit = 17%. Classify the soil as per IS Code. If the specimen of this soil shrinks from a volume of 10 cm3 at Liquid Limit to 6 cm3 at the shrinkage limit, calculate the specific gravity of solids.

14.
    a) Explain the factors affecting permeability of soil.　(5 Marks)

    b) A soil sample of height 6 cm and area of cross section 100 cm2 was subjected to constant head permeability test with head of 36 cm and 90 cc of water passes through the specimen during a test interval of 5 min. Compute the coefficient of permeability of the soil sample.If the same sample is subjected to falling head permeability test and found that head drops from 60 cm to 20 cm in 4 min. Determine the cross sectional area of the stand pipe. (9 Marks)

Module – 3

15.
    a) Explain Quick Sand Condition and Critical Hydraulic Gradient.　(5 Marks)

    b) A sand deposit of 8 m thick was loaded with a uniform surcharge of 10 kN/m2. Water table (WT) is at 3 m below GL. Density of sand is 18 kN/m3 above WT and 19 kN/m3 below WT. Draw Total, Neutral and Effective Stress Diagrams up to 8 m below GL. Take yw = 10 kN/m3.　(9 Marks)

16.
    a) A concentrated load of 500 kN is applied at ground surface. Compute the vertical pressure (i)　at a depth of 5m below the load, (ii) at a distance of 3m at the same depth. Use Boussinesq"s theory.　(7 Marks)

    b) A water tank is founded on a circular ring type of foundation. The ring is of 2.5m width and its external diameter is 10m. Compute the vertical stress at 4m depth beneath the centre of the foundation, if pressure on the foundation is 100kPa.(7Marks)

Module – 4

17.
    a) A 8 m thick clay layer with double drainage settles by 120 mm in 2 years. Cv = 1.5 x 10-3 cm2/sec. Calculate the likely ultimate consolidation settlement and find out how long it will take to undergo 90% of this settlement.　(5 Marks)

    b) A 3m square footing at a depth of 2m from ground level carries a net load intensity of 150 kN/m2. If a compressible clay layer 3m thick exists at a depth of 5m below the footing, determine the settlement of the footing due to consolidation of clay layer. Assume the water table at a depth of 3m below GL. For sand, density = 18 kN/m3 above water table and 19 kN/m3 below water table. For clay layer, LL = 65%, wn = 40% and G = 2.7. Take yw = 10 kN/m3.　(9 Marks)

18.
    a) Explain the field compaction methods.　(5 Marks)

    b) The following are results of a standards proctor compaction test performed on a sample of soil

Water Content %	6	8	10	12	14	16
Bulk Density (kN/m3)	17.7	19.8	21	21.3	20.9	20.2

Plot the water content – dry density curve and obtain Moisture content and Maximum dry density. Also plot the zero air voids curve. Take G = 2.65. (9 Marks)

Module – 5

19.
   a) A cylindrical specimen of soil fails under axial vertical stress of 150 kN/m2, when it is laterally unconfined. Failure plane makes an angle of 53° with the horizontal. Determine shear strength parameters c & ϕ. (5 Marks)
   b) Determine the shear strength parameters using the following data using graphical method:

Sample	Confining Pressure σc (kN/m2)	Deviator Stress σd (kN/m2)
1	100	600
2	200	750
3	300	900

20.
   a) Explain the Swedish circle method for the analysis of slopes for a c-ϕ soil. (5 Marks)
   b) Determine factor of safety of vertical foundation trench 5m deep if c = 50 kN/m2, ϕ = 25°,y = 17 kN/m3. Assume Taylor‟s stability no. Sn = 0.166. (9 Marks)

SYLLABUS

Module 1

Nature of soil and functional relationships : Introduction to soil mechanics – Soil types – Major soil deposits of India - 3 phase system – Basic soil properties : Void ratio, porosity, degree of saturation, air content, water content, specific gravity, unit weight - Relationship between basic soil properties - Numerical problems

Determination of Water content by oven drying, Specific gravity using pycnometer & specific gravity bottle - Determination of Field density by sand replacement method & Core Cutter method - Numerical problems

Soil Structure and their effects on the basic soil properties – Sensitivity and Thixotropy

Module 2

Index properties : Sieve analysis – Well graded, poorly graded and gap graded soils - Stoke‟s law – Hydrometer analysis [no derivation required for percentage finer and diameter] – Relative Density - Numerical problems - Consistency – Atterberg Limits and indices – Plasticity charts - laboratory tests for Liquid Limit, Plastic Limit & Shrinkage Limit - Numerical problems

IS classification of soil - Numerical problems

Permeability of soils : Darcy‟s law – Factors affecting permeability – Laboratory tests: Constant head and falling head permeability tests - Numerical problems - Average permeability of stratified deposits - numerical problems

Module 3

Principle of effective stress - Total, neutral and effective stress – Pressure diagrams - Numerical problems - Pressure diagrams in soils saturated by capillary action – Quick sand condition – Critical hydraulic gradient

Stress distribution : Introduction - Boussinesq‟s equations for vertical pressure due to point loads and line loads – Assumptions and Limitations - Numerical problems - Vertical pressure due to uniformly distributed loads beneath strip, circular and rectangular shapes [no derivation required] - Numerical problems

Approximate methods for vertical stress-distribution of contact pressure beneath footings : Equivalent Point Load method & 2:1 Distribution Method - Numerical problems - Pressure

Isobars - Pressure bulbs – Newmark"s charts (Construction procedure not required) and their use.

Module 4
Consolidation - Definition – Concepts of Coefficient of compressibility and volume compressibility - e-log p curve - Compression index, Recompression index and Pre consolidation Pressure - Normally consolidated, over consolidated and under consolidated soils - Estimation of magnitude of settlement of normally consolidated clays - Numerical problems Terzaghi"s theory of one-dimensional consolidation (no derivation required) - average degree of consolidation – Time factor - Coefficient of consolidation - Numerical problems - Laboratory consolidation test – Determination of Coefficient of Consolidation - Practical Applications
Compaction of soils - Difference between consolidation and compaction - IS Light & Heavy Compaction Tests – OMC and MDD - Zero Air voids line - Numerical problems - Control of compaction - Field compaction methods - Proctor needle for field control

Module 5
Shear strength of soils- Practical Applications - Mohr-Coulomb failure criterion - Mohr circle method for determination of principal planes and stresses– relationship between shear parameters and principal stresses - Numerical problems
Brief discussion of Laboratory tests - Triaxial compression test - UU, CU and CD tests - Total and effective stress strength parameters - Unconfined compression test, Direct shear test and vane shear test – Applicability - Numerical problems
Stability of finite slopes - Toe failure, base failure, slip failure - Swedish Circle Method : $\phi=0$ analysis and c-ϕ analysis - Friction circle method - Taylor"s Stability number - Stability charts - Numerical Problems

QUESTION BANK

MODULE I

3 Mark Questions

1. Briefly explain the mechanism of formation of soils
2. Briefly explain different soil structures
3. List out different clay minerals with neat sketches of their molecular structure
4. Define the following
   a) void ratio b) specific gravity c) dry density d) porosity e) water content
   f) Unit weight g) degree of saturation
5. Briefly explain the oven dry method of water content determination
6. Briefly explain the pycnometer method of specific gravity determination
7. Briefly explain the specific gravity bottle method of specific gravity determination
8. Briefly explain the core cutter method of field density determination
9. Briefly explain the sand replacement method of field density determination
10. What are the major soil deposits in India?

14 Mark Questions

1. Explain the 3-phase soil system and derive equations relating fundamental parameters.
2. The in-situ density of an embankment, compacted at a water content of 12% was determined with the help of a core-cutter. The empty mass of the cutter was 1286 g and the cutter full of soil has a mass of 3195 g, the volume of cutter being 1000 cm. Determine the bulk density, dry density and the degree of saturation of embankment.

If the embankment become fully saturated during rains, what would be its water content and saturated unit weight? Assume no volume change in soil on saturation. Take specific gravity of soil as 2.70.

3. The soil from a borrow area having an average in situ unit weight of 15.5kN/m3 and water content of 10%, was used for the construction of an embankment (total finished volume 6000 cu.m) In half of embankment, due to improper control during rolling, the dry unit weight achieved was slightly lower. If the dry unit weight in the two parts is 16.5 and 165kN/m3, find the volume of borrow area soil used in each part

MODULE II

<u>3 Mark Questions</u>

1. Define Atterberg''s limits
2. Explain I.S classification of soils
3. Explain about Plasticity chart 1
4. Explain Darcy''s law along with its limitations
5. Explain laboratory determination of Co efficient of permeability
6. Derive the equations for average permeabilities of stratified soil deposits considering horizontal and vertical flow conditions

<u>14- mark questions</u>

1. Explain in detail particle size determination of soils
2. Explain in detail Atterberg''s limits along with different methods of its practical determination
3. Explain in detail I.S classification of cohesive and non-cohesive soils.
4. Explain in detail laboratory determination of coefficient of permeability
5. Explain in detail various factors influencing permeability of the soil
6. An undisturbed saturated specimen of clay has a volume of 18.9 cm^3 and a mass of 30.2g.On oven drying the mass reduces to 18g. The volume of dry specimen as determined by displacement of mercury is 9.9 cm^3. Determine the shrinkage limit, specific gravity, and shrinkage ratio and volume shrinkage.
7. Briefly explain the sieve analysis for particle size determination
8. Briefly explain the hydrometer analysis for particle size determination

MODULE III

<u>3 Mark questions</u>
1. Describe different types of soil water
2. Define
• a) Total Stress b) Effective stress c) Pore water Pressure
3. Derive the expression for seepage force per unit volume
4. Explain the phenomenon of quick sand
5. What is critical hydraulic gradient and derive the expression for the same
6. Describe both Boussinesque's equations for vertical loads
7. Derive expressions for pressure due to point loads and uniformly distributed loads
8. Describe Isobar and pressure Bulb
9. Describe in detail how soil pressure can be calculated from Newmark chart

14 marks Questions
1. A Soil profile consists of a surface layer of clay 6m thick and having a saturated unit weight 18.5KN/m^3 and a sand layer of 3m thick of saturated unit weight 17 KN/m^3 overlying impermeable rock. The water table is at the ground surface. If the water level in the standpipe driven into the sand layer rises 3m above the ground surface, draw the plot showing the variation of total Stress, Pore water pressure, and Effective stress. Take unit Weight of water

as 10 KN/m^3

2. Determine the vertical stress intensity at a point 3 m below ground level and 2.5cm away from the line of action of a vertical point load of 150kN acting on the ground surface by Boussinesq"s equation.

3. A water tank is founded on a circular ring type foundation. The ring is of 10m external diameter and 6m internal diameter. Assuming a uniformly distributed load of 300kPa, determine the vertical pressure at a depth of 6m below the center of the foundation.

MODULE IV
3 Mark Questions

1. Explain about proctor and modified proctor test for the evaluation of compactionparameters
2. Define and explain OMC and maximum dry density
3. Briefly explain compaction curve and zero air void line
4. Explain Proctor needle for field compaction control
5. Define consolidation along with parameters like co efficient of volume change, volume compressibility and co efficient of consolidation
6. List out the assumptions of Terzaghi"s theory of one-dimensional Consolidation
7. Explain Oedometer test for the determination of consolidation parameters
8. Explain different methods for determination of co efficient of consolidation from oedometer data.
9. Define Pre consolidation pressure and Casagrande"s method for determination forthe same
10. Differentiate between compaction and consolidation

14-mark questions

1. Explain in detail factors effecting Compaction and the effect of compaction on soilproperties.
2. Describe in detail one dimensional consolidation theorem by Terzaghi
3. Two clay layers A and B are respectively 4m and 5m thick. The time taken for layer A to reach 50% consolidation is 6 months. Calculate the time taken by the layer B to reach the same degree of consolidation. The co-efficient of consolidation of layer B is half the co-efficient of consolidation for layer A. Both the layers have double drainage.
4. A 20 mm. thick specimen of soil takes 16 minutes to reach 50% consolidation in the laboratory when drainage is permitted from both ends. Calculate the coefficient of consolidation. Also, calculate the time required for 90% consolidation for the above sample. How much time will it take for 90% consolidation of 4m thick similar samplein the field with double drainage? Also, calculate the time when drainage is permittedonly from one side.
5. The settlement analysis (based on the assumption of the clay layer draining from top and bottom surfaces) for a proposed structure shows 2.5 cm of settlement in four years and a ultimate settlement of 10 cm. However, detailed sub-surface investigation reveals that there will be no drainage at the bottom. For this situation, determine the ultimate settlement and the time required for 2.5 cm settlement

MODULE V
3 Mark Questions

1. Define shear strength and explain the parameters contributing the same
2. Explain Mohr-Coulomb Theory of shear Strength
3. Explain the procedure for shear strength determination by Direct Shear Method
4. Explain the procedure for shear strength determination by Unconfined CompressiveStrength Method
5. Explain the procedure for shear strength determination by vane shear Method
6. Explain the procedure for shear strength determination by Triaxial compression Method
7. Describe different types of tri axial tests based on the drainage conditions
8. Explain Mohr-Coulomb Theory of shear Strength in detail
9. Describe in detail different methods for shear strength determination

10. Describe slope stability analysis using method of slices
11. Describe slope stability analysis using stability number method
12. Describe slope stability analysis using Swedish Circle Method

14 Mark Questions
1. Explain in detail different methods of slope stability analysis
2. Two identical soil specimens were tested in a triaxial apparatus. First specimen failed at a deviator stress of 770 KN/ m 2 when the cell pressure was 200 KN/ m 2 . Second specimen failed at a deviator stress of 1370 KN/ m 2 under a cell pressure of 400 KN/m2.Determine the value of C and Φ analytically. If the same soil is tested in a direct shear apparatus with a normal stress of 600 KN/m 2 estimate the shear stress at failure
3. In an UCC test, a sample of clay 100mm long and 47mm in diameter fails under a load of 150N at 12% strain. Calculate the shearing resistance taking into account the effect of change in cross-section of the sample.
4. Explain how vane shear test is conducted.
5. The following data have been obtained in a standard laboratory Proctor compaction test on glacial till: The specific gravity of the soil particles is 2.77. The container is 9.44 cm3 in volume and its weight is 19.78 N. Plot the compaction curve and determine the optimum moisture content. Also compute the void ratio and degree of saturation at optimum condition

Water content %	Weight of container and compacted soil (N)
5.02	35.80
8.81	37.30
11.25	39.32
13.05	40.00
14.40	40.07
19.25	39.07

CET206	TRANSPORTATION ENGINEERING	CATEGORY	L	T	P	CREDIT
		PCC	4	0	0	4

Preamble

Objective of the course is to introduce the principles and practice of Highway, Railway, Harbour and dock, Tunnel and Airport Engineering.

Course Outcomes:

	Description
CO No.	At the end of the course, students will be able to:
CO 1	Apply the basic principles of Highway planning and design highway geometric elements
CO 2	Apply standard code specifications in judging the quality of highway materials; designing mixes and pavements
CO 3	Explain phenomena in road traffic by collection, analysis and interpretation of traffic data through surveys; creative design of traffic control facilities
CO 4	Understand about railway systems, tunnel, harbour and docks
CO 5	Express basics of airport engineering and design airport elements

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	1		1	3	1		2		1	2	3
CO 2	3	1	3	1		1	1	1		1		1	2	2
CO 3	3	2	2	1					1	2		2	2	3
CO 4	2						2	1				2	2	3
CO 5	3	3	3			3		2					2	3

Module	Contents	Hours
1	Introduction to Transportation Engineering, Classification of roads, Typical cross sections of roads in urban and rural area, Requirements and factors controlling alignment of roads Introduction to geometric design of highways, Design controls and criteria, Design of highway cross section elements, Design of horizontal alignment - Stopping sight distance, Overtaking sight distance, super elevation, transition curve, length and shift of transition curve, extra widening. Vertical alignment (introduction only)	10
2	Introduction to highway materials, Desirable properties and testing of road aggregates, bituminous materials and sub grade soil. Introduction of flexible and rigid pavements, Factors influencing the design of flexible pavements, Design of flexible pavements by CBR method and IRC 37: 2018. Construction of bituminous pavements	10
3	Introduction to traffic engineering, Traffic characteristics, Capacity and Level of Service, Design Speed, Traffic surveys, Types of road intersections, Traffic control devices (introduction only), Design of isolated signals by Webster''s method.	7
4	Railway Engineering - Component parts of a railway track - functions, concept of Gauges, coning of wheels, cant deficiency, compensation of gradients Tunnel Engineering: Tunnel – sections, tunnel surveying - alignment, transferring centre grade into tunnel. Harbours – classification, features, requirements. Break waters - necessity and functions, classification. Docks – Functions and types - dry docks, wet docks (Introduction only)	9
5	Introduction to Airport Engineering, Components of airport, selection of site for airport. Runway orientation, basic runway length and corrections required, Taxiways and aprons.	9

Model Question Paper
Marks:100 Duration: 3 hrs

PART A
(Answer all questions. Each question carry three marks)

1. With a sketch, explain typical cross sectional layout of a two lane road in urban areas.

2. What is meant by reaction time? What is its role in Geometric design of highways?
3. Outline the IRC 37-2018 recommendations for determining the thickness of Flexible pavements.
4. Differentiate flexible and rigid pavements
5. How would you draw the fundamental diagram of traffic flow
6. Explain grade separated intersections and discuss the advantages and limitations
7. Analyse the concept of negative superelevation with suitable explanations
8. Write short note on i) Littoral Drift ii) offshore moorings
9. Enumerate the various factors which would be kept in view while selecting suitable site for an airport.
10. What are taxiways?

PART B
(Answer one full question from each module)

11.
    a. Enumerate the factors governing the width of carriage way. State the IRC specifications for width of carriage way for various classes of roads. (10)
    b. Write a brief note on classification of highways in India. (4)

OR

12. Calculate the stopping sight distance on a highway for a design speed of 100 kmph. (6)
What is super elevation? Explain the design steps of super elevation. (8)

13. a) Explain the construction practices of the following bituminous base courses.
      1)   Bituminous macadam
      2)   Penetration macadam   (6)

2. The soil subgrade sample was obtained from the project site and the CBR testsconducted at field density gave the following readings. Draw the load penetration curve and determine the CBR value and find the total thickness of the pavement by CBR method as recommended by IRC for commercial vehicles 1500 per day,with 7% growth rate. The pavement construction is to be completed in threeyears after last traffic count.(Use the standard design chart provided

Penetration (mm)	Load (kg)	Penetration (mm)	Load (kg)
0.0	0.0	3.0	60.0
0.5	6.0	4.0	70.0
1.0	17.0	5.0	77.0
1.5	30.0	7.5	89.0
2.0	42.0	10.0	100.0
2.5	55.0	12.5	115.0

OR

14a) Explain with sketches the various types of failures and their causes in rigid pavements?(10)
b) List out the desirable properties of aggregates to be used in pavementconstruction. Also specify various tests for judging the suitability of aggregates.(4)

15a) What are the advantages and disadvantages of traffic signals?   (8)
b) What is (i) Saturation flow, (ii) Lost time, and (iii) Phase in a signal design?   (6)
OR
16   a) Define the basic terms basic capacity, possible capacity and practical capacity and analyze its importance in traffic engineering.   (6)
b) Evaluate the factors affecting level of service of a multilane highway. (8)

17 a) Analyse various types of gradient used on railway track. What is grade compensation and why is it necessary?
b)State the natural and meteorological phenomena a harbour engineer has to study and briefly mention the effects of these phenomena (8)
OR

18   a) What are the different systems of controlling the movement of trains? Explain the working of absolute block system (8)

b) Write notes on lining of tunnels   (6)

19a) Describe the various markings on runways with sketches. (6)

Explain with sketches the basic patterns of runway configurations. (8)

OR

20) What are the primary functions of air traffic control? (4)

b)The length of a runway under standard conditions is 1500m. The airport is to beprovided at an elevation of 110m above mean sea level. The airport referencetemperature is 320C. Following data refers to the proposed longitudinal section ofrunway. Determine the corrected length of runway. (10)

End to end of runway (m)	Grade (%)	End to end of runway (m)	Grade (%)
0 to 300	+1	1500 to 1800	+1
300 to 900	-0.2	1800 to 2100	-0.3
900 to 1500	+0.5		

QUESTION BANK- CET 206: Transportation Engineering

MODULE 1

1. What are the special considerations to be taken while aligning roads on hilly areas?
2. What are the objectives of preliminary survey for highway alignment?
3. Enumerate the factors governing the width of carriage way. State the IRC specifications for width of carriage way for various classes of roads.
4. While aligning a highway in a built up area, it was necessary to provide a horizontal curve of radius 300 m for a design speed 65Km/hr, length of wheel base-6m and pavement width 10.5m. Assume rate of introduction of super elevation as 1 in 100 and super elevation is provided by rotating about centre line. Design super elevation, extra widening of pavement and length of transition curve.
5. What are the points to be kept in view while selecting the alignment between two terminal stations?
6. Explain briefly main features of Indian Road Congress.
7. Write a short note on Carriageway width?
8. Explain the role of kerb.
9. Why are overtaking Zones provided? Draw a neat sketch showing the signs to be installed and their positions.
10. A valley curve is formed by a descending gradient of 1 in 40 which meets a ascending gradient of 1in 30. Design the total length of valley curve if the design speed is 100 km/hr so as to fulfill both comfort condition and head light sight distance requirements after calculating stopping sight distance required. Assume rate of change of change of centrifugal acceleration as 0.6m/sec3, reaction time 2.5 sec and coefficient of friction 0.35.
11. Write a short note on overturning effect.
12. Explain briefly the calculation of length of the transition curve.
13. Derive an expression of summit curve for SSD.
14. Write a short note on setting out of a transition curve.

15. While aligning a highway in a built up area, it was necessary to provide a horizontal circular curve of radius 446 m. The design speed is 85 Kmph, the length of wheel base is 8m and the pavement width is 12m. Design super elevation, extra widening and length of transition curve.
16. What are the factors required for overturning sight distance?
17. How the total reaction time of the driver is measured?
18. Derive an expression for overtaking sight distance.
19. While aligning a hill road with a ruling gradient of 8 percent, a horizontal curve of radius 90m is encountered. Find the compensated gradient at the curve?

MODULE 2

1. The soil subgrade sample was obtained from the project site and the CBR tests conducted at field density gave the following readings. Draw the load penetration curve and determine the CBR value and find the total thickness of the pavement by CBR method as recommended by IRC for commercial vehicles 1500 per day, with 7% growth rate. The pavement construction is to be completed in three years after last traffic count. (Use design chart provided in the question paper)

Penetration (mm)	Load(Kg)	Penetration (mm)	Load (Kg)
0	0	3	58
.5	55	4	70
1	16	5	77
1.5	30	7.5	89
2	42	10	100
2.5	50	12.5	110
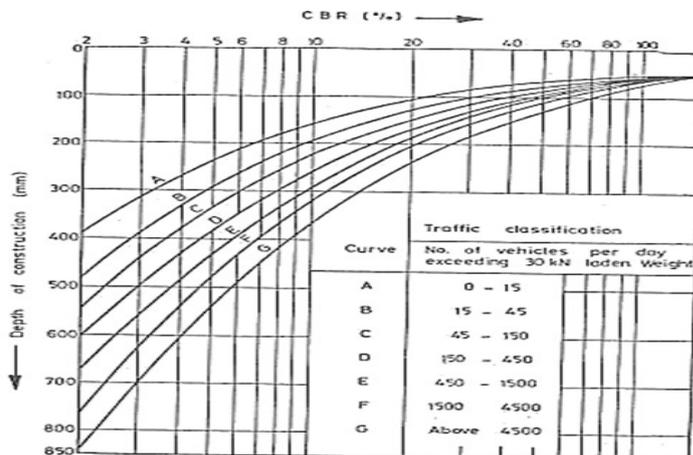
CBR Design chart

2. Outline the IRC 37-2012 recommendations for determining the thickness of Flexible pavements.
3. Explain with sketches the various types of failures and their causes in rigid pavements?
4. List out the desirable properties of aggregates to be used in pavement construction. Also specify various tests for judging the suitability of aggregates.
5. Explain briefly desirable properties of road aggregates.

6. What are the variations in temperature that generally effect the pavement?

7. Discuss the advantages and limitations of CBR method of design. [8M]

8. Calculate the stresses at interior, edge and corner regions of CC pavement using Westergaard's stress equation. Use the following data: Wheel load= 5100 kg, modulus of elasticity is $3*10^5$ kg/cm2, pavement thickness =18cm, Poisson's ratio of concrete = 0.15, modulus of subgrade reaction 6 kg/cm3 and radius of contact area is 15cm.

MODULE 3

1. What is OD survey? List the methods of OD survey. Explain any one method in detail.
2. List out the various factors which affect the road user characteristics in traffic engineering. What are the effects of road user characteristics in traffic performance?
3. What are the requirements of a good highway drainage system?
4. Enumerate AADT.
5. Explain spot speed, running sped, space mean speed, time mean speed and average speed. How is spot speed studies carried out?
6. Discuss various traffic studies and their importance.
7. What are the advantages and disadvantages of traffic signs?
8. Write a short note on Mechanical counters in Traffic Volume Study
9. What are the basic requirements of Intersection at Grade?
10. What are the advantages and disadvantages of traffic signals? (5)
11. What is (i) Saturation flow, (ii) Lost time, and (iii) Phase in a signal design?
12. A fixed time 2-phase signal is to be provided at an intersection having four arms. The design hour traffic and saturation flow are

	North	South	East	West
Design hour flow(pcu/hr)	800	400	750	600
Saturation flow(pcu/hr)	2400	2000	3000	3000

Time lost per phase due to starting delay is 2 sec and All red period is 4 sec. Design two phase traffic signal using Webster's method. Draw the phase diagram also.

5. Explain various types of road markings.

MODULE 4

1. List and define the component parts of a railway track
2. Explain the functions and requirements of rails
3. Enumerate the role of Indian railways in National development
4. With the help of a neat sketch, show the various components of a typical Railway track
5. Write about the engineering surveys to be performed for railway line construction.
6. Name the different modes of transportation. Enumerate the advantages and disadvantagesof (i) Road and (ii) Rail transportation.
7. What is the equilibrium cant on a 20 curve on a BG track, if the speed of various trains are 10 trains at 50kmph., 8 trains at 55 kmph. and 4 trains at 60kmph
8. Explain the various type of gradient used on railway track? What is grade compensation and why is it necessary?
9. What are the factors affecting the selection of gauges?

10. What is Ballast? What are the different types and enumerate the requirements of Good ballast.
11. Determine the number of sleepers required for the construction of 2000 m of BG track, with a sleeper density of N + 7
12. What is a Transition curve, what are the different types and what are the requirements for an ideal transition curve.
13. Explain the following terms (i) Tilting of Rails, (ii) Coning of Wheels. Draw neat sketches, wherever necessary.
14. What are Sleepers? What are the advantages and disadvantages of Concrete sleepers?
15. List the various methods of tunneling in hard and soft rocks. Explain in detail any one tunneling method employed in hard strata and soft soil
16. 2. Write notes on
    (i)   Lighting and Ventilation of tunnels
    (ii)   Lining of tunnels
17. 3. Write down the procedure for constructing a tunnel in clayey soil. Explain its advantages
18. Why shore protection works are necessary? Explain common forms of shore protection works
19. State the natural and meteorological phenomena a harbour engineer has to study and briefly mention the effects of these phenomena
20. What are the various forces acting on breakwater?
21. Distinguish between (i) Wharf and Pier (ii) Transit shed and ware house
22. What are Navigational aids? Briefly describe the different types of Floating signals
23. Define the term Break waters. Enlist the different types.
24. Differentiate between a Jetty and a Wharf. State the conditions under which you will prefer their construction.
25. Differentiate between Natural and Artificial harbours.
26. Define (i) Harbour, (ii) EIS, (iii) Off shore Moorings and (iv) Turning basin

MODULE 5

1. Explain with sketches the basic patterns of runway configurations.
2. Enumerate the various factors which would be kept in view while selecting suitable site for an airport.
3. Describe the various markings on runways with sketches. (5)
4. What are the primary functions of air traffic control? (3)
5. The length of a runway under standard conditions is 1500m. The airport is to be provided at an elevation of 110m above mean sea level. The airport reference temperature is 320C. Following data refers to the proposed longitudinal section of runway. Determine the corrected length of runway.

End to end of runway(m)	Grade(%)	End to end of runway(m)	Grade(%)
0 to 300	+1	1500 to 1800	+1
300 to 900	-.2	1800 to 2100	-.3
900 to 1500	+.5		

CEL202	MATERIAL TESTING LAB - I	CATEGORY	L	T	P	CREDIT

Preamble: The course aims to enrich the understanding of the fundamental concepts of mechanics of deformable bodies through systematic experimental techniques for the estimation of various mechanical properties of engineering materials

Course Outcomes: After the completion of the course, the student will be able to:

Course Outcome	Course Outcome Description
CO 1	The understand the behaviour of engineering materials under various forms and stages of loading.
CO 2	Characterize the elastic properties of various materials.
CO3	Evaluate the strength and stiffness properties of engineering materials under various loading conditions.

Mapping of course outcomes with program outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	2	1	3	-	-	2	2	-	2
CO 2	3	2	2	2	1	3	-	-	2	2	-	2
CO 3	3	2	2	2	1	3	-	-	2	2	-	2

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	75	75	2.5 hours

Continuous Internal Evaluation Pattern:

Attendance   :   15 marks
Continuous Assessment   :   30 marks
Internal Test (Immediately before the second series test)   : 30 marks

End Semester Examination Pattern: The following
guidelines should be followedregarding award of marks
(a) Preliminary work : 15 Marks
(b) Implementing the work/Conducting the experiment : 10 Marks
(c) Performance, result and inference (usage of equipment and trouble shooting: 25
(d) Viva voce: 20 marks
(e) Record : 05 Marks

SYLLABUS

Exercise 1. Study on stress-strain characteristics of mild steel and by conducting uniaxial tension test on rod specimens

Exercise 2. Study on stress-strain characteristics of tor steel by conducting uniaxial tension test on rod specimens

Exercise 3. Study on estimation of shear capacity of mild steel specimen by conducting a double shear test on rod specimen.

Exercise 4.   Study on flexural behaviour of steel by conduction of test on RSJ (I cross section)

Exercise 5. Study on torsional behaviour and estimation of modulus of rigidity of steel by conducting torsion test on rod specimens

Exercise 6. Study on estimation of modulus of rigidity of steel and brass / copper materials utilizing the principles of torsional vibrations.

Exercise 7. Study on estimation of toughness properties of steel specimens by conducting (a) Izod &(b) Charpy impact tests.

Exercise 8. Study on estimation of hardness properties of engineering materials such as brass, aluminium, copper, steel etc.by performing Brinell hardness test

Exercise 9. Study on estimation of Hardness properties of engineering materials such as brass, aluminium, copper, steel etc.by performing

       Rockwell hardness test

       Vicker''s hardness test

Exercise 10. Study on estimation of modulus of rigidity of steel by performing tension tests on spring specimens.

Exercise 11. Study on estimation of modulus of rigidity of steel by performing compression tests on spring specimens

Exercise 12. Study on flexural behaviour of timber material by performing tests on beam specimens.

Exercise 13.   Study on estimation of compression strength of timber specimen.

Exercise 14.   Experiment on verification of Maxwell''s reciprocal theorem

Exercise 15. Bend &rebend test on mild steel specimen

EST200 DESIGN AND ENGINEERING

SYLLABUS

Module	Details	Hours
I	Design Process: - Introduction to Design and Engineering Design, Defining a Design Process-: Detailing Customer Requirements, Setting Design Objectives, Identifying Constraints, Establishing Functions, Generating Design Alternatives and Choosing design.	5
II	Design Thinking Approach: -Introduction to Design Thinking, Iterative Design Thinking Process Stages: Empathize, Define, Ideate, Prototype and Test. Design Thinking as Divergent-Convergent Questioning. Design Thinking in a Team Environment.	5
III	Design Communication (Languages of Engineering Design):-Communicating Designs Graphically, Communicating Designs Orally and in Writing. Mathematical Modelling In Design, Prototyping and Proofing the Design.	5
IV	Design Engineering Concepts: -Project-based Learning and Problem-based Learning in Design. Modular Design and Life Cycle Design Approaches. Application of Biomimicry, Aesthetics and Ergonomics in Design. Value Engineering, Concurrent Engineering, and Reverse Engineering in Design.	5
V	Expediency, Economics and Environment in Design Engineering: -Design for Production, Use, and Sustainability. Engineering Economics in Design. Design Rights. Ethics in Design	5

PREAMBLE:

The purpose of this course is to

   I.   Introduce the undergraduate engineering students the fundamental principles of design engineering,
  II.   Make them understand the steps involved in the design process and
 III.   Familiarize them with the basic tools used and approaches in design.
  IV.   Students are expected to apply design thinking in learning as well as while practice engineering, which is very important and relevant for today. Case studies from various practical situations will help the students realize that design is not only concerned about the function but also many other factors like customer requirements, economics, reliability, etc.along with a variety of life cycle issues.

The course will help students to consider aesthetics, ergonomics and sustainability factors in designs and also to practice professional ethics while designing

COURSE OUTCOMES

After Completing the course, the students should be able to :	
CO1	Explain the different concepts and principles involved in design engineering.
CO2	Apply design thinking while learning and practicing engineering.
CO3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.

CO-PO/PSO MAPPING OF MET204MANUFACTURING PROCESS

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

Note

1: Slight(Low)   2:Moderate(Medium)   3: Substantial (High)   *"-"nocorrelation*

Model Question paper
Course Code: EST 200
Course Name: DESIGN AND ENGINEERING

Max. Marks: 100   **Duration: 3 Hours**

PART A

Answer all questions, each question carries 3 marks Use only hand sketches

1.   Write about the basic design process.
2.   Describe how to finalize the design objectives.
3.   State the role of divergent-convergent questioning in design thinking.
4.   Discuss how to perform design thinking in a team managing the conflicts.
5.   Show how engineering sketches and drawings convey designs.
6.   Explain the role of mathematics and physics in design engineering process.
7.   Distinguish between project-based learning and problem-based learning in design engineering.
8.   Describe how concepts like value engineering, concurrent engineering and reverse engineering influence engineering designs?

9.   Show how designs are varied based on the aspects of production methods, life span, reliability and environment?
10.   Explain how economics influence the engineering designs?

(10x3 marks =30 marks)

Part B
Answer any ONE question from each module. Each question carry 14 marks

Module 1

(11)Show the designing of a wrist watch going through the various stages of the design process. Use hand sketches to illustrate the processes.

or

(12)Find the customer requirements for designing a new car showroom. Show how the design objectives were finalized considering the design constraints?

Module 2

(13)Illustrate the design thinking approach for designing a bag for college students within a limited budget. Describe each stage of the process and the iterative procedure involved. Use hand sketches to support your arguments.

or

(14)Construct a number of possible designs and then refine them to narrow down to the best design for a drug trolley used in hospitals. Show how the divergent-convergent thinking helps in the process. Provide your rationale for each step by using hand sketches only.

Module 3

(15)Graphically communicate the design of a thermo flask used to keep hot coffee. Draw the detailed 2D drawings of the same with design detailing, material selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches.

or

(16)Describe the role of mathematical modelling in design engineering. Show how mathematics and physics play a role in designing a lifting mechanism to raise 100 kg of weight to a floor at a height of 10 meters in a construction site.

Module 4

(17)Show the development of a nature inspired design for a solar poweredbus waiting shed beside a highway. Relate between natural and man-made designs. Use hand sketches to support your arguments.

or

(18)Show the design of a simple sofa and then depict how the design changes when considering 1) aesthetics and 2) ergonomics into consideration. Give hand sketches and explanations to justify the changes in designs.

Module 5

(19)Examine the changes in the design of a foot wear with constraints of 1) production methods, 2) life span requirement, 3) reliability issues and 4) environmental factors. Use hand sketches and give proper rationalization for the changes in design.

or

(20)Describe the how to estimate the cost of a particular design using ANY of the following:
i)a website, ii) the layout of a plant, iii) the elevation of a building, iv) anelectrical or electronic system or device and v) a car.
Show how economics will influence the engineering designs. Use hand sketches to support your arguments.

Module-1 (Design Process)

Part A- Each Question carries 3 marks
1. What does it mean to design something?
2. How is engineering design different from other kinds of design?
3. Where and when do engineers design?
4. What are the basic vocabularies in engineering design?
5. How to learn and do engineering design?
6. How to do engineering design? Illustrate the process with an example.
7. How to identify the customer requirements of design?
8. How to finalize the design objectives?
9. How to identify the design constraints?
10. How to express the functions of a design in engineering terms?
11. How to generate or create feasible design alternatives?
12. How to identify the "best possible design"?
13. Conduct exercises for designing simple products going through the different stages of design process.
14. Write a note on the basic design process.
15. Describe how to finalize the design objectives?

Part B- Each Question carries 14 marks

1. Show the designing of a wrist watch going through the various stages of the design process. Use handsketches to illustrate the processes.
2. Find the customer requirements for designing a new car showroom. Show how the design objectiveswere finalized considering the design constraints?

Module-2 Part A- 3 marks

1. How does the design thinking approach help engineers in creating innovative and efficient designs?
2. How can the engineers arrive at better designs utilizing the iterative design thinking process?
3. Describe how to create a number of possible designs and then how to refine and narrow down to the'best design'.
4. How to perform design thinking as a team managing the conflicts?
5. State the role of divergent-convergent questioning in design thinking.
6. Discuss how to perform design thinking in a team managing the conflicts.

Part B- Each Question carries 14 marks

1. Illustrate the design thinking approach for designing a bag for college students within a limited budget.Describe each stage of the process and the iterative procedure involved. Use hand sketches to support your arguments.
2. Construct a number of possible designs and then refine them to narrow down to the best design for a drug trolley used in hospitals. Show how the divergent-convergent thinking helps in the process. Provideyour rationale for each step by using hand sketches only.

Module-3 (Design Communication)

Part A- Each Question carries 3 marks
1. How do engineering sketches and drawings convey designs?
2. How can a design be communicated through oral presentation or technical reports efficiently?
3. How do mathematics and physics become a part of the design process?

4. How to predict whether the design will function well or not?

 5. Show how engineering sketches and drawings convey designs.

 6. Explain the role of mathematics and physics in design engineering process.

Part B- Each Question carries 14 marks

 1. Graphically communicate the design of a thermo flask used to keep hot coffee. Draw the detailed 2D drawings of the same with design detailing, material selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches.

 2. Describe the role of mathematical modelling in design engineering. Show how mathematics and physics play a role in designing a lifting mechanism to raise 100 kg of weight to a floor at a height of 10meters in a construction site.

Module 4 (Design Engineering Concepts):

Part B- Each Question carries 3 marks

1. Distinguish between project-based learning and problem-based learning in design engineering?
2. Describe how concepts like value engineering, concurrent engineering and reverse engineeringinfluence engineering designs?
3. How does project based learning work?
4. Explain the aspects of problem based learning?
5. Give example for problem-based learning and project based learning?
6. What is modular design architecture?
7. Explain the benefits and effects of modular design?
8. Explain Life cycle design approach?
9. What is biomimicry and how it can be adapted in designs with an example?
10. Explain the application of aesthetics in design with example?
11. Explain the application of ergonomics in design with example?
12. Explain the concept of value engineering in creation of a design?
13. How the concept of concurrent engineering influence a design?
14. Explain how concept of reverse engineering influences design?

Part B- Each Question carries 14 marks

1. Show the development of a nature inspired design for a solar powered bus waiting shed besidea highway. Relate between natural and man-made designs. Use hand sketches to support your arguments.
2. Show the design of a simple sofa and then depict how the design changes when considering 1) aesthetics and 2) ergonomics into consideration. Give hand sketches and explanations to justify the changes in designs.

Module-5 (Expediency, Economics and Environment in Design Engineering Process) Part A- Each Question carries 3 marks

 1. How designs are finalized based on the aspects of production methods, life span, reliability andenvironment?

 2. How to estimate the cost of a particular design and how will economics influence the engineeringdesigns?

 3. What are design rights and how can an engineer put it into practice?

 4. How do ethics play a decisive role in engineering design?

5. Show how designs are varied based on the aspects of production methods, life span, reliability andenvironment?
6. Explain how economics influence the engineering designs?
7. Explain the ethical aspects of design process?
8. Explain the importance of ethics in engineering design?
9. Give an example (situation) for design ethics?

Part B- Each Question carries 14 marks

1. Examine the changes in the design of a foot wear with constraints of 1) production methods, 2) life span requirement, 3) reliability issues and 4) environmental factors. Use hand sketches and give properrationalization for the changes in design.
2. Describe how to estimate the cost of a particular design using ANY of the following: i) a website, ii) the layout of a plant, iii) the elevation of a building, iv) an electrical or electronic system or device and v) a car. Show how economics will influence the engineering designs. Use hand sketches to support your arguments?

CODE MCN202	COURSE NAME CONSTITUTION OF INDIA

Preamble:

The study of their own country constitution and studying the importance environment as well as understanding their own human rights help the students to concentrate on their dayto day discipline. It also gives the knowledge and strength to face the society and people

Course Outcomes: After the completion of the course the student will be able to

CO 1	Explain the background of the present constitution of India and features.
CO 2	Utilize the fundamental rights and duties.
CO 3	Understand the working of the union executive, parliament and judiciary.
CO 4	Understand the working of the state executive, legislature and judiciary.
CO 5	Utilize the special provisions and statutory institutions.
CO 6	Show national and patriotic spirit as responsible citizens of the country

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO	PO	PO
CO 1						2	2	2		2		
CO 2						3	3	3		3		
CO 3						3	2	3		3		
CO 4						3	2	3		3		
CO 5						3	2	3		3		
CO 6						3	3	3		2		

Syllabus

Module 1
Definition of constitution, historical back ground, salient features of the constitution.
Preamble of the constitution, union and its territory. Meaning of citizenship, types, termination of citizenship.
ModuleII
Definition of state, fundamental rights, general nature, classification, right to equality ,right to freedom , right against exploitation. Right to freedom of religion, cultural and educational rights, right

to constitutional remedies. Protection in respect of conviction for offences.
Directive principles of state policy, classification of directives, Fundamental duties.

Module III
The Union executive, the President, the vice President, the council of ministers, the Prime minister, Attorney-General, functions.
The parliament, composition, Rajya sabha, Lok sabha, qualification and disqualification of membership, functions of parliament.
Union judiciary, the supreme court, jurisdiction, appeal by special leave.

Module IV
The State executive, the Governor, the council of ministers, the Chief minister, advocate general, union Territories.
The State Legislature, composition, qualification and disqualification of membership, functions.
The state judiciary, the high court, jurisdiction, writs jurisdiction.

Module V
Relations between the Union and the States, legislative relation, administrative relation, financial Relations, Inter State council, finance commission.
Emergency provision, freedom of trade commerce and inter course, comptroller and auditor general of India, public Services, public service commission, administrative Tribunals.
Official language, elections, special provisions relating to certain classes, amendment of the Constitution.

Model Question paper
PART A
(Answer all questions. Each question carries 3 marks)
1. Define and explain the term constitution.
2. Explain the need and importance of Preamble.
3. What is directive principle of state policy?
4. Define the State.
5. List the functions of Attorney general of India.
6. Explain the review power of Supreme court.
7. List the qualifications of Governor.
8. Explain the term and removal of Judges in High court.
9. Explain the powers of public service commission.
10. List three types of emergency under Indian constitution.

PART B

(Answer one question from each module. Each question carries 14 marks)

Module 1
11. Discuss the various methods of acquiring Indian citizenship.
12. Examine the salient features of the Indian constitution.
    Module 2
13. A high court passes a judgement against X. X desires to file a writ petition in the Supreme Court under Art32, on the ground that the judgment violates his fundamental rights.Advise him whether he can do so.
14. What is meant by directive principles of State policy? List the directives.
    Module3
15. Describe the procedure of election and removal of the President of India.
16. Supreme court may in its discretion grant special leave to appeal. Examine the situation.
    Module 4
17. Discuss the powers of Governor.
18. X filed a writ petition under Art 226 which was dismissed. Subsequently, he filed a writ petition under Art 32 of the constitution, seeking the same remedy. The Government argued that the writ petition should be dismissed, on the ground of res judicata. Decide.
    Module 5
19. Examine the scope of the financial relations between the union and the states.
20. Discuss the effects of proclamation of emergency.

QUESTION BANK MCN 202 CONSTITUTION OF INDIA

MODULE 1

1. Explain the historical background of the Indian constitution.
2. Explain the salient features of the Indian constitution.
3. Discuss the importance of preamble in the implementation of constitution.
4. Define and explain the term constitution.
5. Explain the need and importance of Preamble.
6. What is meant by citizenship and how its termination occurs
7. Discuss the various methods of acquiring Indian citizenship.
8. Examine the salient features of the Indian constitution.

MODULE 2

1. What are fundamental rights? Examine each of them.
2. Examine the scope of freedom of speech and expression underlying the constitution.
3. The thumb impression of an accused is taken by the police against his will. He contends that this is a violation of his rights under Art 20(3) of the constitution. Decide.
4. What is directive principle of state policy?
5. Define the State.
6. A high court passes a judgement against X. X desires to file a writ petition in the supreme court under Art32, on the ground that the judgement violates his fundamental rights. Advise him whether he can do so.
7. What is meant by directive principles of State policy? List the directives.

MODULE 3

1. Describe the procedure of election and removal of the President of India.
2. Supreme court may in its discretion grant special leave to appeal. Examine the situation.
3. List the functions of Attorney general of India.
4. Explain the review power of Supreme court.
5. Explain the powers of the President to suspend the fundamental rights during emergency.
6. Explain the salient features of appeal by special leave.
7. List the constitutional powers of President.

MODULE 4

1. Discuss the constitutional powers of Governor.
2. Examine the writ jurisdiction of High court.
3. Discuss the qualification and disqualification of membership of state legislature.
4. List the qualifications of Governor.

5. Explain the term and removal of Judges in High court.
6. Discuss the powers of Governor.
7. X filed a writ petition under Art 226 which was dismissed. Subsequently, he filed a writ petition under Art 32 of the constitution, seeking the same remedy. The Government argued that the writ petition should be dismissed, on the ground of res judicata. Decide.

MODULE 5

1. Examine the scope of the financial relations between the union and the states.
2. Discuss the effects of proclamation of emergency.
3. Explain the powers of public service commission.
4. List three types of emergency under Indian constitution.
5. Explain the advantages of citizenship.
6. List the important principles contained in the directive principles of state policy.
7. Discuss the various aspects contained in the preamble of the constitution

CEL204	FLUID MECHANICSLAB

Preamble: The course is designed to train the students to familiarize and understand the different flow measurement equipment"s and their procedures. Students will be introduced to a team working environment where they develop the necessary skills of experimentation techniques for the study of flow phenomena in channels/pipes

Course Outcomes: After the completion of the course, the student will be able to:

Course Outcome (CO)	Course Outcome Description
CO 1	Apply fundamental knowledge of Fluid Mechanics to corresponding experiments
CO 2	Apply theoretical concepts in Fluid Mechanics to respective experiments
CO 3	Analyse experimental data and interpret the results
CO 4	Document the experimentation in prescribed manner

Mapping of course outcomes (COs) with program outcomes (POs)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	-	-	-	-	-	2	3	-	-	-
CO 2	2	2	-	-	-	-	-	2	3	-	-	-
CO 3	3	3	-	2	-	-	-	2	3	3	-	-
CO 4	1	-	-	-	-	-	-	2	2	3	-	-

List of Exercises/ Experiments (Any 12 experiments out of 15 need to be performed mandatorily. Lab experiments may be given considering 12 sessions of 3 hours each)

1. Study of taps, valves, pipe fittings, gauges, Pitot tubes, water meters and current meters.

2. Calibration of Pressure gauges
3. Determination of met centric height and radius of gyration of floating bodies.
4. Verification of Bernoulli''s theorem
5. Hydraulic coefficients of orifices and mouth pieces under constant head method and time of emptying method.
6. Calibration of Venturimeter
7. Calibration of Orifice meter
8. Calibration of water meter.
9. Calibration of rectangular notch
10. Calibration of triangular notch.
11. Time of Emptying through orifice
12. Plotting Specific Energy Curves in Open Channel flow
13. Study of Parameters of Hydraulic Jump in Open channel Flow.
14. Determination of friction co-efficient in pipes
15. Determination of loss co-efficient for pipe fittings

CET 294	PAVEMENT CONSTRUCTIONAND MANAGEMENT

Preamble

Objective of the course is to introduce the principles and practice of Highway construction and infrastructure asset management

Course Outcomes:

	Description
CO No.	At the end of the course, students will be able to:
CO 1	To understand the characterization of materials used for pavement construction
CO 2	To carry out mix design of various bituminous mixes
CO 3	To study construction practices of flexible pavement and equipment used
CO 4	To understand the construction practices and reinforcement design of rigid pavement
CO 5	To study the fundamentals of pavement evaluation and pavement management system

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	1		1	3	1		2		1	2	3
CO 2	3	1	3	1		1	1	1		1		1	2	2
CO 3	3	2	2	1					1	2		2	2	3
CO 4	2						2	1				2	2	3
CO 5	3	3	3			3		2					2	3

<div align="center">SYLLABUS</div>

Module 1

Pavement: functions and characteristics- Types of pavement: flexible pavement, rigid pavement, comparison- Different layers of flexible and rigid pavement

Pavement materials: characterization of sub grade soil, soil classification system, properties of road aggregate, principles and methods of gradation of soil aggregate mixes, characteristics and uses of bitumen, emulsion cutback and modified bitumen.

Module 2

Bituminous pavement types: penetration layer system and premixed aggregate- specification of materials,

Mix design:physical and volumetric properties of bituminous mix, Marshall method of mix design, Super pave mix design

Module 3

Construction of flexible pavement: functions of various layers, preparation and construction of sub grade, granular sub base (GSB), WBM, WMM, Bituminous macadam, Different types of wearing courses. specifications/ guild lines, equipment used for the construction of different layers in flexible pavement, quality control for flexible pavement construction

Module 4

Construction of cement concrete pavement: material characterization, preparation of subgrade and base, Types of joints in Rigid pavements its functions and design, presetting reinforcement in joints and PCC slab construction

Module 5

Introduction to pavement management system(PMS): concept, definition, objectives, components, general structure- data collection pavement evaluation, functional and structural evaluation, pavement deterioration models, pavement management levels: network, programme and project level- types of pavement management system, Types of Maintenance and rehabilitation activities, life cycle cost analysis of strategies, popular software

BUS TIMINGS
(from VJEC)

KANNUR	THALIPARAMBU	CHERUPUZHA	KUDIYANMALA	MANANTHAVADY	IRITTY
6.40 AM	5.40 AM	6.30 AM	4.00 AM	8. AM	6.15 AM
7.40 AM	6.40 AM	7.15 AM	8.50 AM	8.45 AM	7.30 AM
10.05 AM	7.00 AM	7.45 AM	11.05 AM	4.30 PM	7.45 AM
1.10 PM	7.45 AM	8.15 AM	12.35 PM	5.00 PM	8.15 AM
3.30 PM	8.25 AM	9.35 AM	2.05 PM		8.40 AM
4.15 PM	8.35 AM	10.10 AM	3.25 PM		8.50 AM
	9.00 AM	11.15 AM	5.15 PM	**KASARGOD**	9.30 AM
VELLARIKUNDU	9.30 AM	11.40 AM	5.40 PM	7.15 AM	10.00 AM
9.00 AM	9.45 AM	12.35 PM	5.50 PM	9.30 AM	10.25 AM
9.30 AM	10.10 AM	1. PM	6.30 PM	1.15 PM	10.45 AM
11.30 AM	10.40 AM	2. PM			11.00 AM
3.00 PM	11.00 AM	3.05 PM	**CHEEKKAD**	**ETTUPARA**	11. AM
	11.15 AM	3.30 PM	5.50 PM	7.45 AM	11.45 AM
KONNAKKD	11.50 AM	3.50 PM		8.10 AM	12.30 PM
7.50 AM	12.25 PM	4.00 PM	**MANIPAL**	8.45 AM	1.10 PM
2.10 PM	12.45 PM	4.25 PM	9.30 AM	9.40 AM	1.40 PM
3.50 PM	1.10 PM	5.15 PM		9.50 AM	2. PM
	1.30 PM	6. PM		11.50 AM	3.30 PM
PANATHUR	2.10 PM			12.30 PM	3.45 PM
1.10 PM	3.15 PM		**SULTHANBATHERY**	2.00 PM	4. PM
4.00 PM	3.35 PM		3.00 PM	3.10 PM	4.40 PM
	3.45 PM			4.00 PM	5.00 PM
	4.10 PM		**PALA**	4.50 PM	5.45 PM
	4.15 PM	**BANGLORE**	5. PM	5.50 PM	6.00 PM
THALASSERY	4.25 PM	7.30 AM	5.30 PM	6.35 PM	7.30 PM
3. PM	4.50 PM	11.10 AM	5.45 PM	7.45 PM	9.00 PM
6.00 PM	5.30 PM	7.30 PM	6.00 PM	8.15 PM	
1.00 AM	6.25 PM	9.30 PM	7.00 PM	9.10 PM	