

**ACADEMIC REGULATIONS
PROGRAM STRUCTURE AND DETAILED
SYLLABUS**

**COMPUTER SCIENCE ENGINEERING
DEPARTMENT**

(Applicable For Batches Admitted From 2019 – 2020)



**VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY
(AUTONOMOUS)**

DUVVADA - VISAKHAPATNAM – 530 049

(An Autonomous Institute, Accredited by NAAC, Affiliated to JNTUK, Kakinada, AP)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY

(AUTONOMOUS)

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ACADEMIC REGULATIONS

(VR 19)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (AUTONOMOUS)
VISAKHAPATNAM

ACADEMIC REGULATIONS for M. Tech. (Regular)
(Applicable for the batches admitted from 2019 onwards)

The selection for category A and B seats shall be as per Govt. of Andhra Pradesh rules.

1. Award of M. Tech. Degree

A student will be declared eligible for the award of the M. Tech. Degree if he/she fulfills the following academic regulations.

Pursued a course of study for not less than two academic years and not more than four academic years.

Candidate has to register for 68 credits and shall secure 68 credits with all courses.

Students who fail to register for their two years course of study within four years or fail to acquire the 68 credits for the award of the degree within four academic years from the year of their admission shall forfeit their seat in M. Tech course and their admission shall stand cancelled.

2. Programs of Study

The following programs of study are offered at present for specialization in the M. Tech. Course.

Specialization Code	Specialization	Department
15	Machine Design (MD)	Mechanical Engineering (ME)
22	Transportation Engineering (TE)	Civil Transportation (CE)
25	Software Engineering (SE)	Computer Science & Engineering (CSE)
38	Digital Electronics & Communication Systems (DECS)	Electronics & Communication Engineering (ECE)
40	Information Technology (IT)	Information Technology (IT)
42	Power & Industrial Drives (P & ID)	Electrical & Electronics Engineering (EEE)
58	Computer Science & Engineering (CSE)	Computer Science & Engineering (CSE)
70	Electronics & Communication Engineering (ECE)	Electronics & Communication Engineering (ECE)
*Code has to be released by University	Artificial Intelligence and Machine learning	Computer Science & Engineering (CSE)

And any other courses as approved by the Board of studies and Academic council from time to time.

3. Registration

A student shall register for courses in each semester as per the courses offered by the concerned

department.

4. Curricular Program

The Curriculum of the two year M. Tech Course has been designed to achieve a healthy balance between theory & lab hours, industry experience and to develop technical skills required for a career in the industry or a career in research.

5. Distribution and Weightage of Marks

Theory Courses including electives (100Marks)

For the theory subjects 70 marks shall be awarded based on the performance in the End Semester Examination and 30 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction.

The semester end examinations will be conducted for 70 marks consist of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

Laboratory Course (100Marks)

For practical subjects, 70 marks shall be awarded based on the performance in the End Semester Examinations and 30 marks shall be awarded based on the day-to-day performance as Internal Marks.

- a) Internal 30 marks shall be awarded as follows:
 - i) Day to day assessment including record – 10 marks
 - ii) Internal examination – 20 marks
- b) External examination shall be conducted for 70 marks.
 - i) Aim, theory and procedure – 15marks, ii) Execution – 25 marks
 - iii) Results/Program output – 15 marks, iv) Viva-voce – 15 marks

External Laboratory examinations for M. Tech courses must be conducted with two Examiners. Laboratory class teacher acts as internal examiner and external examiner shall be appointed by the Chief Superintendent of Examinations from the panel of experts recommended by the HOD.

Mini project with seminar (100 Marks)

For Mini Project with Seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee (PRC) consisting of Head of the Department, supervisor/mentor and two other senior

faculty members of the department. For Mini Project with Seminar, there **will be only internal evaluation** of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

Mini project report is evaluated for 100 marks.

- a) Assessment by the supervisor /guide for 30 marks
- b) Assessment by PRC for 40 marks (20 marks x 2 reviews)
- c) Seminar presentations for 30 marks (department level committee assessment)

Audit courses: List of the audit courses will be notified from time to time. An indicative list of the courses is as shown below.

All audit courses will be “Pass/Fail” courses with no specific credit point allotted. The result of the student in the audit course will be notified in the marks memo. A student must pass all the audit courses registered to be eligible for the award of M.Tech. degree.

Note: Audit course will be totally internal evaluation. Mid and End semester examinations shall be conducted for all Audit courses. It is mandatory to pass all Audit Courses.

Project/Dissertation

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee (PRC).

- i) Continuous assessment of Dissertation-I and Dissertation-II during the semester(s) will be monitored by the PRC.
- ii) **Dissertation- I/Industrial project:** In Dissertation- I, literature review, design calculations and a prototype model are to be prepared within 16 weeks.
- iii) ***In case of Industrial project, students have to complete coursework related to the particular semester through MOOCs***
- iv) The evaluation of Dissertation-I/Industrial project will be purely internal for 100 marks based on the presentation of literature review, design calculations and demonstration of prototype model.
- v) In **Dissertation – II**, experimentation, analysis (analytically or using modern software tools), results & discussion and conclusions are to be prepared and submitted.
- vi) A candidate shall submit his status report after each review. Minimum three reviews at PRC level shall be conducted in a gap of one month each for both Dissertation – I & II.
- vii) Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The Board shall jointly evaluate the candidate’s work for a maximum of 100 marks.

6. Attendance Requirements

Aggregate 75% of the attendance is required for promotion to next semester.

Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee based on genuine medical grounds. ***This privilege is given to any student only once during the entire program of study.***

A stipulated fee shall be payable towards condonation of shortage of attendance.

Shortage of attendance may be considered for the students who participate in prestigious sports, co-curricular and extra-curricular activities if their attendance is in the minimum prescribed limit.

Note: Shortage of Attendance below 65% in aggregate shall not be condoned in any case.

7. Academic Requirements

The following academic requirements have to be satisfied in addition to the attendance requirements.

For all courses, student is considered to be passed upon securing minimum 40% marks in the external examination alone and minimum 50% marks from both internal and external examination put together.

Note: For courses where there is no internal evaluation pass mark is 50% from external & vice-versa.

8. Supplementary Examinations

There is no supplementary examination for PG course.

9. Examinations and Evaluation

9.1. General guidelines

- i. All the semester end examinations are conducted for duration of three hours under the supervision of the Chief Superintendent of Examinations.
- ii. **Pattern of end examination paper (for theory courses):**
 - a. External examination shall be conducted for 70 marks.
 - b. The semester end examinations will be conducted for 70 marks consist of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.
- iii. Dean of Evaluation, who reports to the Chief Superintendent of Examinations is responsible for planning, conduct of the examinations and declaring results etc.,
- iv. The Controller of the examinations ensures that all the four sets of question papers received from the external paper setters comply with the guide lines.
- v. Chief Superintendent of Examinations picks up a question paper at random from a set of four papers submitted by the Controller of the Examinations, three hours before the commencement of the examinations.
- vi. Moderation: Moderation is carried in order to verify whether all the questions given fall within the framework of prescribed syllabus and Unit wise distribution.
- vii. Controller of the Examinations with the support of Additional Controller of Examinations gets the question papers printed course-wise in the required number.

- viii. With the help of special invigilators, question papers are distributed to the examination halls five minutes prior to the commencement of Examination.
- ix. Special Inspection Squad headed/nominated by Chief Superintendent of Examination makes surprise visit to the Examination Halls to ensure the proper conduct of Examination.
- x. The spot valuation is completed within 15 days after the conduct of every examination by following the regular process of coding and decoding of the answer scripts.
- xi. Chief Examiner / Evaluators for the respective courses are identified and nominated by the Head of the Department. Evaluators will comprise of internal and external course experts.
- xii. Two level evaluation methodologies are adopted for the sake of paper evaluations with one internal and one external evaluator. If the difference of the marks from both the evaluations is more than 15%, then such papers are sent for third evaluation. If the difference of the marks awarded by the internal expert and the external expert is less than or equal to 15% then the highest mark among the two is awarded for the student.
- xiii. For laboratory examinations, the evaluation is done by internal examiner and one external examiner.
- xiv. Results shall be announced within 30 days after the completion of the last examination.

9.2. Revaluation

There is a provision for revaluation of theory courses if student fulfils the following norms.

The request for revaluation must be made in the prescribed format duly recommended by the Chief Superintendent of Examination through Additional Controller along with the prescribed revaluation fee.

9.3. Challenge Revaluation

If the student is very confident, there is a provision for challenge revaluation for the courses as per the following norms.

- i. The challenge revaluation will be carried out by a three-member committee comprising of an external course expert nominated by Principal / Chief Superintendent of Examinations, the faculty member who taught the course chosen by student from the same institute and the third member is the Head of the respective department/faculty nominated by HOD.
- ii. The candidate will forfeit the challenging revaluation fee if the difference in the marks awarded by the committee and the initial awarded marks is not more than or equals to 15%. If the difference in marks is more than 15%, the challenge fee will be returned to the candidate. The marks awarded in the Challenge revaluation will be the final.

10. Grading System

Absolute grading system shall be followed for the award of grades

Grade Point

It is a numerical weight allotted to each letter grade on a 10-point scale.

Grades and Grade Points

Marks Range (in %)	Letter Grade	Level	Grade Point
≥ 90	O	Outstanding	10
≥ 80 to < 90	A	Excellent	9
≥ 70 to < 80	B	Very Good	8
≥ 60 to < 70	C	Good	7
≥ 50 to < 60	D	Satisfactory	6
< 50	F	Fail	0
		Absent	-1
		Withheld	-2
		Malpractice	-3

Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Average. (SGPA) and Cumulative Grade Point Average (CGPA):

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$SGPA (S_i) = \frac{\sum(C_i \times G_i)}{\sum C_i}$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

Computation of CGPA

- The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.
- $CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i}$
- Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.
- Equivalent Percentage = $(CGPA - 0.75) \times 10$

11. Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree, he shall be placed in one of the following three classes:

Class Awarded	CGPA to be secured	Based on CGPA secured from 68 Credits
First Class with Distinction	≥ 7.75 with no subject failures	
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	

12. General Instructions

Where the words 'he', 'him', 'his', occur they imply 'she', 'her', 'hers', also.

The academic regulations should be read as a whole for the purpose of any interpretation.

In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, Academic Council is final.

The college may change or amend the academic regulations or syllabi from time to time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

13. Transitory Regulations

If a student is detained and has to get Re-admitted and follow the same regulation of year of admission.

Transcripts

After successful completion of the entire program of study, a transcript containing performance of all academic years will be issued as a final record. Partial transcript will also be issued up to any point of study to a student on request, after payment of requisite fee.

The Academic Calendar consisting of instruction period of the program is released for every academic year before the commencement of the class work.

There shall be no program transfers after the completion of the admission process. There shall be no transfer from one college/stream to another.

14. Withholding of Results

If the student has not paid the fee dues, if any, to the Institute or in any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

15. Disciplinary Action Guidelines for Malpractices

S.No	Nature of Malpractices/ Improper conduct	Punishment
1 (a)	If the candidate possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.

3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	If the candidate smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	If the candidate uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	If the candidate refuses to obey the orders of the Chief Superintendent/Assistant Superintendent / any officer on	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the

	<p>duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.</p>	<p>candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.</p>
7	<p>If the candidate leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</p>	<p>Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.</p>
8	<p>If the candidate possesses any lethal weapon or firearm in the examination hall.</p>	<p>Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the</p>

		remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	<p>Student of the college, expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.</p> <p>Person(s) who do not belong to the College will be handed over to police and. a police case will be registered against them.</p>
10	If the candidate comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Academic committee of the Institute for further action to award suitable punishment.	

15.1. For Malpractices identified by squad or special invigilators

Punishments to the candidates will be given as per the above guidelines.

16. UGC recommended punishment for Ragging

- i. Suspension from attending classes and academic privileges
- ii. Withholding/withdrawing scholarships/fellowship and other benefits.
- iii. Debarring from appearing in any test/examination or other evaluation process
- iv. Withholding results
- v. Debarring from representing the institution in any regional, national or international meet, tournament, youth festival etc.
- vi. Suspension/expulsion from the hostel
- vii. Cancellation of admission
- viii. Rustication from the institution for period ranging from 1 to 4semesters.
- ix. Expulsion from the institution and consequent debarring from admission to any other institution for a specified period.
- x. Fine may extend up to Rs. 2.5lakh.

M.Tech (TRANSPORTATION ENGINEERING)**DEPARTMENT OF CIVIL ENGINEERING****PROGRAM STRUCTURE**

[Minimum Credits to be earned:68]

I Semester							
S.No	Code	Subject	L	T	P	Credits	
1	2022191100	Pavement Materials and Construction	3	1*	0	3	
2	2022191101	Highway Traffic Analysis and Design	3	1*	0	3	
3	Programme Elective – I	2022191150	Ground Improvement Techniques	3	1*	0	3
		2022191151	RS & GIS for Transportation Engineering				
		2022191152	Numerical Methods and Applied Statistics				
4	Programme Elective –II	2022191153	Intelligent Transportation Systems	3	0	0	3
		2022191154	Transportation System Modeling and Simulation				
		2022191155	Bridge Engineering				
5	2022191110	Highway Aggregates and Soil Testing Lab	0	0	4	2	
6	2022191111	Bituminous Testing and Pavement Evaluation Lab	0	0	4	2	
7	2000191100	Research Methodology and IPR	2	0	0	2	
8	2000191130	Soft Skills	2	0	0	0	
Total						18	

II Semester							
S.No.	Course Code	Courses	L	T	P	Credits	
1	2022191200	Pavement Analysis and Design	3	1*	0	3	
2	2022191201	Transportation Planning	3	1*	0	3	
3	2022191250	Program Elective - III	Traffic Flow Theory	3	1*	0	3
	2022191251		Pavement Construction				
	2022191252		Aviation Infrastructure and Planning				
4	2022191253	Program	Port and Harbor Engineering	3	0	0	3
	2022191254		Sustainable Urban and Transport				

		Elective - IV	Development				
	2022191255		Environmental Impact Assessment				
5	2022191210	Traffic Engineering Laboratory		0	0	4	2
6	2022191211	Transportation Simulation Lab		0	0	4	2
7	2000191230	Constitution of India (Audit Course)		2	0	0	0
8	2022191270	Mini Project with Seminar		0	0	4	2
Total credits							18

II Year – Sem- I							
S. No	Course code	Courses		L	T	P	Credits
1	2022192150	Program Elective-5	1. Financial and Economic Analysis of Transportation Projects	3	0	0	3
	2022192151		2. Highway Safety Engineering				
	2022192152		3. Computational Techniques in Transportation Engineering				
2	2022192160	Open Elective	1. MOOCs- (NPTEL/SWAYAM)-Any 12 Week Course on Engineering/ Management/ Mathematics offered by other than parent department	3	0	0	3
			2. Course offered by other departments in the college				
3	2022192170	Dissertation-I/ Industrial Project #		0	0	20	10
Total Credits							16

Students going for Industrial project / Thesis will complete these courses through MOOCs

II Year – Sem- II							
S. No	Course code	Courses		L	T	P	Credits
1	2022192270	Dissertation-II		0	0	32	16

Courses offered by Civil Engineering Department to other departments as Open Elective							
S.No.	Code	Course		L	T	P	Credits
1	2022191152	Numerical Methods and Applied Statistics		3	0	0	3
2	2022191255	Environmental Impact Assessment		3	0	0	3

M. TECH. - TRANSPORTATION ENGINEERING

(CIVIL ENGINEERING)

I Year – I Semester

Subject Code	PAVEMENT MATERIALS AND CONSTRUCTION	L	T	P	C
2022191100		3	1*	0	3

Course Objectives:

The student will be taught

1. To analyze the properties of pavement materials and analyze its suitability in various layers of pavements
2. To learn various methods for bitumen mix design.
3. To study the stages involved in the construction of flexible and bituminous pavements
4. To know the kind of equipment needed for the construction of road and its operation etc.

Course Outcomes:

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

1. Assess the suitability of aggregates used in various layers of pavement as well as the bitumen used in the wearing course
2. Determine the optimum bitumen content by applying the bitumen mix design methods
3. understand the sequential stages involved in the construction of flexible and bituminous pavements

Decide the kind of equipment needed for the construction of road and its operation etc

Course Content:**Unit-I:****Aggregates, Bitumen and Tar Properties:**

Classification, requirements, properties and tests on road aggregates, concepts of size and gradation-design gradation, maximum aggregate size, aggregate blending to meet specification. Origin of bitumen, preparation, properties and chemical constitution of bituminous road binders; requirements. Emulsion, cutbacks, preparation, characteristics, uses and tests, Adhesion failure, mechanism of stripping, tests and methods of improving adhesion

Unit-II:

Bituminous mixes: Mechanical properties, dense and open textured mixes, flexibility and brittleness, No-Hveem Stabilometer & Hubbard-field tests bituminous mix, design methods using Routh-futchs Method only and specification using different criteria-voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen.

Unit-III:

Equipment in Highway Construction:

Various types of equipment for excavation, grading and compaction-their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

Unit-IV:

Flexible and cement concrete pavements:

Earthwork grading and construction of embankments and cuts for roads, preparation of sub-grade, quality control tests. Specifications of materials, construction method and field control checks for various types of flexible pavement layers. IRC method of flexible pavement design.

Unit-V:

IRC Specifications and method of cement concrete pavement construction; Quality control tests; construction of various types of joints.

Text Books:

1. Yoder and Witczak, Principles of Pavement Design, John Wiley and Sons
2. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.
3. W.Ronald Hudson, Ralph Haas and Zeniswki , Modern Pavement Management, Mc Graw Hill and Co Relevant IRC Codes
4. Sharma, S. C., Construction Equipment and its Management, 6thEd., Khanna Publishers, 2015.

Reference Books:

1. RRL, DSIR, Bituminous Materials in Road Construction, 4thEd. HMSO Publication. 1962.
2. RRL, DSIR, Soil Mechanics for Road Engineers, 8thEd., HMSO Publication, 1974

Subject Code	HIGHWAY TRAFFIC ANALYSIS AND DESIGN	L	T	P	C
2022191101		3	1*	0	3

Course Objectives:

The student will be taught

1. To analyze the current issues in traffic engineer and understanding of the factors influencing road vehicle performance.
2. To find the highway capacity and level of service for road stretches.
3. To study types parking's and design parking facility
4. To be aware of various Traffic Regulation.
5. To study types signal systems of design traffic signals.

Course Outcomes:

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

1. Develop a basic Knowledge of the fundamental issues in traffic engineering and understanding of the factors influencing road vehicle performance
2. Understand Headways and Gap acceptance behavior.
3. Define the critical procedures for highway capacity and level of service analysis
4. Build knowledge on traffic signal theory and elements of traffic signal Operations design the links and intersections

Course Content:

Unit-I:

Elements of Traffic Engineering:

Road user, vehicle and road way and driver characteristics. - Design speed, volume. Passenger Car Units - Static and Dynamic- Highway capacity and level of service - capacity of urban and rural roads - Road user facilities - Parking facilities - Cycle tracks - Pedestrian facilities.

Unit-II:

Traffic Studies, Measurement and Analysis:

Volumestudies, speed studies; Presentation of volume and speed study data; Headways and Gaps; Critical Gap; Gap acceptance studies. Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways Multilane highways and freeways.

Unit-III:

Design of intersections:

At-grade intersections- Principles of design – Channelization - Design of rotaries - Traffic signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram – Signal co-ordination – Area traffic Control System.

Unit-IV:

Parking Studies and Accident studies:

Types of parking facilities-on street parking and off street Parking facilities; Parking studies and analysis. Accident studies and analysis; Causes of accidents- Traffic Safety – Principles and Practices – Safety along links - Safety at intersections.

Unit-V:

Traffic Regulation and Environment:

Traffic Signals-Design of Isolated Traffic Signal by Webster method, Warrants for signalization, Signal Co-ordination methods, Simultaneous, Alternate, Simple progression and Flexible progression Systems. Detrimental effects of Traffic on Environment; Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic.

Textbook Books:

1. J. S. Arora, Introduction to Optimum Design, McGraw Hill International Ed., NY, 1989
2. S. S. Rao, Engineering Optimization: Theory and Practice, New Age International (P) Ltd., 2001
3. AASHTO A Policy on Geometric Design of Highway and Streets
4. Pignataro, L.J., Traffic Engineering – Theory & Practice, John Wiley, 1985
5. R. J. Salter and N. B. Hounsel, Highway Traffic Analysis and Design, Macmillan Press Ltd, 1996.

Subject Code	GROUND IMPROVEMENT TECHNIQUES (Elective I)	L	T	P	C
2022191150		3	1*	0	3

Course Objectives:

The student will be taught

1. To study different type of modern ground improvement techniques.
2. To learn how to improve weak soils by modern ground improvement techniques.
3. To study the role of soil reinforcement in soil stabilization.
4. To know the importance of geo-synthetics in ground improvement.
5. To Design and construction of reinforced earth structures.

Course Outcomes:

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

1. Apply the principles of ground improvement to a given site condition.
 2. Prioritize the right technique to improve different difficult grounds.
 3. Propose the best suitable ground modification technique for different grounds.
 4. Choose the best admixture for stabilization of ground for different grounds.
- Build knowledge on importance and application of Gabion walls and crib walls.

Course Content:**Unit-I:**

Need and objectives of Ground Improvement, Classification of Ground Modification Techniques- suitability and feasibility, Emerging Trends in ground improvement. Mechanical Modification; Principles and methods of soil compaction, Compaction control, Compaction piles, dynamic compaction, Vibro float technique, controlled blasting for compaction.

Unit-II:

Stabilization with admixtures like cement, lime, calcium chloride, fly-ash and bitumen. Grouting: Categories of grouting, Grout materials, Grouting techniques and control

Unit-III:

Methods of dewatering open sumps and ditches, Well-point system, Electro-osmosis, Vacuum dewatering; Pre-loading without and with and drains, strip drains and drop drains.

Unit-IV:

Types of Geo-textiles, Woven and non-woven fabrics, Geo-membranes, Geo-grids, Geo-composites, Geo-nets, Functions and applications, Properties of geo-textiles.

Unit-V:

Reinforced Earth and In-Situ Ground Treatment for slopes

Concept of soil reinforcement, Reinforcing materials, Backfill criteria, Design and construction of reinforced earth structures. Soil nailing, Rock anchoring, Micro-piles, design methods, construction techniques; Gabion walls, Crib walls.

Textbook Books:

1. Manfred R. Hansmann-Engineering principles of ground modification, 2nd edition, McGraw-Hill Pub. Co. New York, 1986
2. P. Purushotham Raj-Ground Improvement Techniques, 1st edition, Laxmi Publications (P) Limited, 1999

Reference Books:

1. Robert M. Koerner-Construction and Geotechnical methods in Foundation Engineering- McGraw-Hill Pub. Co., New York, 1984
2. Winterkorn and Fang-Foundation Engineering Hand Book, 1st edition, Van Nostrand Reinhold Co. New York, 1967

Subject Code	RS & GIS FOR TRANSPORTATION ENGINEERING (Elective I)	L	T	P	C
2022191151		3	1*	0	3

Course Objectives:

The student will be taught

1. To understand Remote Sensing and Remote Sensing Platforms & Sensors
2. To study about Geographic Information System and Types of data representation
3. The GIS Spatial Analysis and Global Positioning System
4. To learn the Intelligent Transportation Systems(ITS) applications in Transportation Engineering

Course Outcomes:

1. Interpret various remotely sensed images with the help of acquired knowledge in remote sensing technology
2. Apply the GPS instrument in field for various applications
3. Make use of the techniques of RS, GIS and GPS techniques in different transportation engineering applications
4. Extend knowledge on Intelligent Transportation systems

Course Content:**Unit-I:****Introduction to Remote Sensing and Remote Sensing Platforms & Sensors:**

Basic concepts and foundation of remote sensing, Elements involved in remote sensing, Electromagnetic spectrum, remote sensing terminology and units, Energy resources, energy interactions with earth surface features and atmosphere and spectral properties of vegetation, soil and water bodies, Concept of resolution in Remote Sensing.

Unit-II:**Remote Sensing Platforms & Sensors:**

Introduction, Characteristics of imaging remote sensing instruments, satellite remote sensing system-a brief over view, other remote sensing satellites. Elements of Visual Interpretation and techniques digital data analysis

Unit-III:

Geographic Information System and Types of data representation:

Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS. Types of data representation: Data collection, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS–File management, Spatial data–Layer based GIS, Feature based GIS mapping

Unit-IV:

GIS Spatial Analysis and Global Positioning System:

Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data. Global Positioning System: Introduction, elements of satellite surveying, the global positioning system, GPS satellites, adjustment computations, GPS observables.

Unit-V:

Transportation Engineering Applications:

Intelligent Transportation Systems (ITS) for road accessibility study, GIS data base design for physical facility planning, Decision support systems for land use planning. GIS based Highway alignment, GIS based road network planning, and GIS based traffic congestion analysis and accident investigation. Network planning. GIS-T Applications and some case studies

Textbook Books:

1. Thomas M. Lillesand, Ralph.W.Kiefer, Jonathan.W.Chipman, Remote Sensing and Image Interpretation 5thEd., Wiley India Pvt Ltd,2011
2. A.M.Chandra and S.K.Ghosh, Remote Sensing and Geographical Information System,Second edition, Narosha Publications,2015
3. M.Anji Reddy, Remote Sensing and Geographical Information system,4th edition, B.S.Publications, 2012.
4. Alfred Leick, GPS Satellite Surveys, Third edition, John Willey & Sons.,2004.

Reference Books:

1. James B. Cambell, Taylor & Francis, Introduction to Remote Sensing,4thedition,Taylor& Francis2007
2. Floyd F. Sabins,Remote Sensing: Principles and Interpretation 3rd Ed.,2007
3. Basudeb Bhatta, Remote Sensing and GIS, Oxford University Press, 2008
4. P.A. Longley, M.F. Goodchild, D.J. Manguire, D.W. Rhino, Geographical Information System, Volume I: Principal and Technical Issues, John Wiley & Sons, 2005
5. P.A. Longley, M.F. Goodchild, D.J. Manguire, D.W. Rhino, Geographical Information System, Volume II: Principal and Technical Issues, John Wiley & Sons, 2007

Subject Code	NUMERICAL METHODS AND APPLIED STATISTICS (Elective I)	L	T	P	C
2022191152		3	1*	0	3

Course Objectives:

The student will be taught

1. To learn the different numerical techniques.
2. To be introduced the fundamentals of probability.
3. To know the concepts of sampling and regression.

Course Outcomes:

1. Apply the different numerical techniques to transportation problems.
2. Understand applications of probability theory.
3. Use regression and correlation analysis to process transportation data.

Course Content:**Unit-I:****Linear system:**

Gaussian elimination and Gauss – Jordan methods – matrix inversion – Gauss seidel method – Nonlinear equations – Regula falsi and Newton- Raphson methods – interpolation – Newton’s and Lagrange’s interpolation.

Unit-II:**Linear Programming:**

Graphical and Simplex methods – Measures of central tendency, dispersion, skewness and Kurtosis – Probability – conditional probability – Bayes’ theorem

Unit-III:**Random variable –**

Two dimensional random variables – standard probability distributions – Binomial Poisson and normal distributions - moment generating function

Unit-IV:

Design of bridges, Steel Bridges And Substructure:

Sampling distributions – confidence interval estimation of population parameters – testing of hypotheses – Large sample tests for mean and proportion – t-test, F-test and Chi-square test – curve fitting-method of least squares.

Unit-V:

Construction And Maintenance:

Regression and correlation – rank correlation – multiple and partial correlation – analysis of variance-one way and two way classifications – experimental design – Latin square design – Time series analysis.

Textbook (s)

1. Bowker and Liberman, Engineering Statistics, Prentice-Hall, 1972.
2. Venkatraman, M.K., Numerical Methods in Science and Engineering, National Publisher Company

Subject Code	INTELLIGENT TRANSPORTATION SYSTEMS (Elective II)	L	T	P	C
2022191153		3	1*	0	3

Course Objectives:

The student will be taught

1. To learn the fundamentals of Intelligent Transportation Systems (ITS).
2. To study the ITS functional areas.
3. To have an overview of ITS implementation in developing countries.

Course Outcomes:

1. Understand the sensor and communication technologies
2. Apply the various ITS methodologies
3. Define the significance of ITS under Indian conditions

Course Content:**Unit-I:**

Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection

Unit-II:

Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centers (TMC). Vehicle – Road side communication – Vehicle Positioning System.

Unit-III:

ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

Unit-IV:

ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

Unit-V:

Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries

Text Books:

1. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.
2. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
3. National ITS Architecture Documentation, US Department of Transportation, 2007 (CD-ROM).

Subject Code	TRANSPORTATION SYSTEM MODELING AND SIMULATION (Elective II)	L	T	P	C
2022191154		3	1*	0	4

Course Objectives:

The student will be taught

1. To understand the various steps involved in modeling Process.
2. To learn various probability distributions.
3. To understand the Pattern Recognition and Growth and Decay Processes
4. To understand the language that can be used in modeling process.

Course Outcomes:

1. Develop an understanding of the fundamentals of pavement modeling processes
2. Extend knowledge on the Key Relationships and physical laws of models
3. Build knowledge on growth and decay processes
4. Distinguish between virtual and real problems related to various simulation processes
Select the best simulation language that can be applied in modeling process

Course Content:**Unit-I:****Modeling Process:**

Taxonomy of model types; Steps in modelbuilding; Simulation; Algorithms and Heuristics; Simulation Languages

Unit-II:**Primitive Models and Forecasting:**

Establishing relationships via physical laws; establishing relationships via curve fitting; Parameters estimation problems; Elementary state transition models. Nature of data; Statistical attributes of data; probability distributions and their mechanisms; Generation of random numbers; Time series.

Unit-III:**Pattern Recognition:**

Neighborhood and distances; Cluster analysis, Individual and group preference patterns,

Unit-IV:

Growth and Decay Processes:

Discrete and continuous growths; Limits to growth; Competition among species; Growth process and integralequations; Discrete event approach; population planning

Unit-V:

Simulation of Discrete and Continuous Processes:

Monte Carlo methods; Stochastic Simulation; System identification; Inverse problems; Virtual reality; typical example and case studies related to Civil Engineering.

Text Books:

1. R.Haberman, Mathematical Models, 2nd edition, Prentice Hall, 1977
2. D.P.Maki and M.Thompson, Mathematical Models and Applications, 2nd edition, Prentice Hall, 1973

Reference Books:

1. R.E.Shannon, System Simulation: Art and Science, 2nd edition, Prentice Hall, 1975

Subject Code	BRIDGE ENGINEERING (Elective II)	L	T	P	C
2022191155		3	1*	0	4

Course Objectives:

The student will be taught

1. To develop an understanding of basic concepts in bridge engineering like components, classification, importance, investigation of bridges and loading conditions.
2. To study the design of Culvert, Foot Bridge, Slab Bridge, T-beam Bridge and Box Culvert using IRC.
3. To study the design of various sub-structures like piers, abutments, foundations and the importance of bearing and joints in bridge construction.
4. To study the types and priority of maintenance required for varies type of structures.

Course Outcomes:

1. Prepare a detailed project report for the construction of bridge giving hydraulic particulars of the river and soil details and be able to select the suitable site and type of the bridge
2. Design various types of bridges like Culvert, Slab Bridge and T-beam Bridge using provisions of IRC
3. Design pier, abutment, foundations, bearing and detailing of joints.
4. Prioritize the best type of maintenance to be applied to different defects in bridges

Course Content:**Unit-I:****Introduction and LoadsonBridges:**

Brief History on Bridges ,Types of Bridges ,Materials issued ,Bridges construction, Design Philosophy (AASTHOSSpecification) – Conceptson Bridges Aesthetics. Gravity –Loads-(Lateral Loads-Deformation induced loads-Collision loads.

Unit-II:

Analysis of Bridges and Culverts: Muller-Breslau Principle-Influence lines for statically Determinate andIndeterminatebeams-Load paths-Computer Analysis of Bridges and Construction Sequence in Analysis.

Unit-III:

Introduction-Reinforced concrete slab and Box culvert-Example for R.C. Slab culvert-Author's charts for design of deck slab of slab bridges.

Unit-IV:

Design of RC Bridges, Steel Bridges And Substructure: Concrete deck slab-Slab Bridge design-T beam design. Definition-Bed block-Materials for piers and abutments-Piers-Forces due to wave action and collision-Example of design of pier-Abutments-Example of design of abutment. Brief description various types of steel bridges-Design of truss and plate girder bridges.

Unit-V:

Construction and Maintenance: Construction method-short span bridges-Long span bridges-Form work and false work for concrete bridges- Construction management- Numbering of Bridges-Maintenance – Bridge failures

Text Books:

1. D.J. Victor, Essentials of Bridge Engineering, Fifth edition, Oxford & IBHPub, New Delhi, 2014
2. Aswani, Vazirani & Ratvani, Fourth edition, Bridge Engineering, 2014
3. N. Krishna Raju, Design of Bridges, Third edition, Oxford & IBH, New Delhi, 1988

Reference Books:

1. R.P. Pama & A.R. Cusens, Bridge Deck Analysis, 1st edition, John Wiley & Sons, 1975
2. T.R. Jagadish & M.A. Jairam, Design of Bridge Structures, 2nd edition, Prentice Hall of India, N. Delhi, 2004

Subject Code	HIGHWAY AGGREGATES AND SOIL TESTING LAB	L	T	P	C
2022191110		0	0	3	2

Course Objectives:

The students will be explained

1. To analyze quality behavior of road aggregates.
2. To develop knowledge of quality behavior of sub-grade soils.

Course Outcomes:

The students will be able to

1. Develop knowledge of quality behavior of sub-grade soils.
2. Utilize aggregate and bitumen properties in pavement design.

Road Aggregates

1. Aggregate Shape tests
2. Aggregate Impact Test
3. Los Angeles Abrasion Test
4. Compressive strength of Aggregates
5. Specific Gravity Test and Water Absorption Test

Soil

1. Tests on sub grade soils.
 2. Soil stabilization tests.
 3. California Bearing Ratio Test.
 4. Soil Classification & Grain size analysis.
- ❖ Mini project based on field and laboratory studies and data collected.

List of Equipment:

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers
4. Los angles Abrasion test machine
5. Deval's Attrition test machine
6. Length and elongation gauges.

Text Book(s):

1. A. Veeraragavan, S. K. Khanna & C.E.G Justo, Highway Materials and Pavement testing, Nem Chand & Bros. Publisher,2013
2. L.R. Kadiyali, Traffic Engineering and transportation Planning, 7th edition, Khanna Publishers, 2011

Subject Code	BITUMINOUS TESTING AND PAVEMENT EVALUATION LAB	L	T	P	C
2022191111		0	0	3	2

Course Objectives:

The students will be explained

1. To know the types of bitumen and their quality behavior.
2. To Utilize aggregate and bitumen properties in pavement design.
3. To examine the unevenness of existing pavements.
4. To develop Knowledge on mix design of Flexible pavements.

Course Outcomes:

The students will be able to

1. Develop Knowledge on types of bitumen and their quality behavior.
2. Utilize aggregate and bitumen properties in pavement design.
3. Examine the unevenness of existing pavements.
4. Develop Knowledge on mix design of Flexible pavements.

Bitumen And Tar Tests As Per Is Code Provisions

1. Penetration Test
2. Ductility Test
3. Softening point Test
4. Flash and Fire Point Test
5. Viscosity test
6. Stripping Test

Tests On Pavement Evaluation (Demonstration)

1. Benkelman Beam tests
2. Roughness survey of roads
3. Pavement evaluation using DCP
4. Road unevenness by MERLIN
5. Marshall Stability Mix Design-Analysis

List of Equipment:

1. Bitumen penetration test setup.
2. Bitumen Ductility test setup.
3. Ring and ball apparatus
4. Viscometer.
5. Automated Marshall Testing Machine.
6. Stop Watches
7. Benkelman Beam
8. Friction Tester
9. Thin Film Oven
10. Water Bath With Digital Controller
11. Freezing Cabinet
12. Dynamic Cone Penetrometer
13. Light Weight Deflectometer

Text Book(s):

- 1) A. Veeraragavan, S. K. Khanna & C.E.G Justo, Highway Materials and Pavement testing, Nem Chand & Bros. Publisher,2013
- 2) L.R. Kadiyali, Traffic Engineering and transportation Planning, 7th edition, Khanna Publishers, 2011

Subject Code	RESEARCH METHODOLOGY AND IPR	L	T	P	C
2000191100		2	0	0	2

Course Objectives:

The student will be taught

To impart knowledge to students related to identify and formulation of research problem and impart knowledge on Intellectual Property and Patent Rights.

Course Outcomes:

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

1. Identify research problem.
2. Able to find solutions for research problem.

Course Content:**Unit-I:**

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

Unit-II:

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a reviewcommittee.

Unit-III:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting underPCT.

Unit-IV:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit-V:

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.

Subject Code	SOFT SKILLS	L	T	P	C
2000191130			2	0	0

Course Objectives:

The student will be taught

1. To prepare project title.
2. To prepare a project report.
3. To identify gaps in literature.
4. To improve writing and presentation skills of the project .

Course Outcomes:

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

1. **Teamwork** – learning to connect and work with others to achieve a set task.
2. **Leadership** – assessing the requirements of a task, identifying the strengths within the team, utilizing the diverse skills of the group to achieve the set objective, awareness of risk/safety.

Course Content:**Unit-I:**

Planning and Preparation, Word Order, Breaking up long sentences. Structuring Paragraphs and Sentences, Being concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Unit-II:

Clarifying Who Did What, Highlighting your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction.

Unit-III:

Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

Unit-IV:

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, useful phrases, how to ensure paper is as good as it could possibly be the first-time submission.

Unit-V:

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions.

M. TECH. - TRANSPORTATION ENGINEERING

(CIVIL ENGINEERING)

I Year – II Semester

Subject Code	PAVEMENT ANALYSIS AND DESIGN	L	T	P	C
2022191200		3	1*	0	3

Course Objectives:

The student will be taught

- To impart knowledge to students related to analysis and design of pavements with respect to Highways and Airports.

Course Outcomes:

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

- Know the components of rigid and flexible pavements
- Know the stresses, strains and deflections in rigid and flexible pavements; traffic loading; and material characterization.
- Design methodologies for both rigid and flexible pavements

Course Content:**Unit-I:****Introduction:**

of pavement structure, importance of sub grade soil, properties on pavement performance. Functions of sub grade, sub base, base course and wearing course. **Stresses in Flexible Pavements:** Stresses in homogeneous masses and layered systems, deflections, shear failures, equivalent wheel and axle loads.

Unit-II:**Elements in Design of Flexible Pavements :**

Loading characteristics-static, impact and repeated loads, effects of dual wheels and tandem axles, area of contact and tyre pressure, modulus or CBR value of different layers, equivalent single wheel load, equivalent stress and equivalent deflection criterion; equivalent wheel load factors, climatic and environmental factors.

Unit-III:**Design Methods for Flexible Pavements:**

California bearing ratio (CBR) method, U.S. Navy method. Triaxial method, Mcleod method, Boussinesq's and Burmister's analysis and design method, Triaxial method, Design of flexible pavements, IRC method for Flexible Pavement Design.

Unit-IV:

Rigid Pavements:

Wheel load stresses, Soil sub grade, Westergaard's analysis, Bradbury's approach, Arlington test, Pickett's corner load theory and influence charts.

Unit-V:

Temperature Stresses:

Westergaard's and Thomlinson's analysis of warping stresses, Combination of stresses due to different causes, Effect of temperature variation on Rigid Pavements.

Reinforced Concrete Slabs:

Prestressed concrete slabs-general details. Design of Tie Bars and Dowel Bars

Text Books:

1. Yoder, E.J. and Witczak, M.W., "Principles of Pavement Design 2nd Ed", John Wiley & Sons, Inc. 1975
2. O'Flaherty, A. Coleman, "Highways : The Location, Design, Construction and Maintenance of Road Pavements", 4th Ed., Elsevier 2006
3. Fwa, T.F., "The Handbook of Highway Engineering", CRC Press Taylor & Francis Group 2006
4. Khanna, S.K. and Justo, C.E.G., "Highway Engineering", Nem Chand Jain & Bros. 2005
5. Papagiannakis, A.T. and Masad, E.A., "Pavement Design and Materials, John Wiley & Sons Inc. 2008

Subject Code	TRANSPORTATION PLANNING	L	T	P	C
2022191201		3	1*	0	3

Course Objectives:

The student will be taught

1. To learn mode of travel and route choice behavior
1. To learn the fundamentals of transportation planning
2. To understand the classical methods of urban transportation planning
3. To be acquainted with the transportation land use interaction

Course Outcomes:

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

1. Build knowledge on Factors underlying traveler choices of mode of travel and route choice
2. Understand urban activity system and travel patterns
3. Know four stage travel demand modelling
4. Define the classical methods of urban transportation planning

Course Content:**Unit-I:****Introduction and Urban Transportation System Planning- Conceptual Aspects:**

Transport and Socioeconomic Activities, Historical Development of Transport, Transportation in the Cities, Freight Transportation, and Future Developments. Transport Planning Process, Problem Definition, Solution Generation, Solution Analysis, Evaluation and Choice, Implementation.

Unit-II:**Trip Generation Analysis and Mode Choice Modeling:**

Fourstep Travel Demand forecasting approach, Trip Production Analysis, Zonal models, Category Analysis, Trip Attraction Modeling: Influencing Factors, Earlier Modal Split Models, Trip-End Type Modal Split Model, Trip-Interchange Modal Split Model, Disaggregate Mode-Choice Model, Logit Model of Mode Choice, Binary Choice Situations, Multinomial Logit model, Model calibration, Case studies.

Unit-III:

Trip Distribution Models:

PAMatrix, ODMatrix, Basis of Trip Distribution, Gravity Model, Calibration of Gravity Model, Singly and Doubly Constrained Gravity Models. Growth Factor Methods of Trip Distribution, Uniform Factor Method, Average Factor Method, Fratar Growth-Factor Method, and Disadvantage of Growth Factor Method.

Unit-IV:

Route Assignment:

Description of transport network, Route Choice Behavior, The, Minimum Path Algorithm, Route Assignment Techniques, All-or-Nothing Assignment, Multipath Traffic Assignment, Capacity-Restrained Traffic Assignment.

Unit-V:

Transportation Surveys:

Definition of Study Area, Zoning, Types of Movements, Types of Surveys, Home-Interview Survey, Commercial Vehicle Survey, Intermediate Public Transport Survey, Public Transport Survey, Roadside-Interview Survey, Cordon-Line Survey, Post-Card Questionnaire Survey, Registration-Number Survey, Tag-on-Vehicle Survey.

Text Books:

1. Adib Kanafani, Transportation Demand Analysis, First edition, McGraw Hill, 1983
2. John W Dickey, Metropolitan Transportation Planning, 2nd edition, Tata Mc. Graw Hill, 1986
3. Juan De Dios Dios Ortuzar & Luis G Wilumsen (1996), Modeling Transport, Second Ed., John Wiley, 1996

Reference Books:

1. NPTEL-Videlectures for "Urban Transportation Planning" by Dr. V. Thamizh Arasan, 2012
2. NPTEL-Material for "Transportation Engineering" by Dr. Tom. V. Mathew, 2010

Subject Code	TRAFFIC FLOW THEORY (Elective III)	L	T	P	C
2022191250		3	1*	0	4

Course Objectives:

1. To be introduced to traffic flow theory.
2. To study macroscopic and microscopic modelling.
3. To learn the fundamentals of ITS.

Course Outcomes:

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

1. Analyze the traffic stream parameters.
2. Apply the queuing theory.
3. Define the significance of ITS under Indian conditions.

Course Content:**Unit-I:**

Traffic stream parameters - Fundamental diagram of volume-speed-density surface. Discrete and continuous probability distributions. Merging maneuvers - critical gaps and their distribution.

Unit-II:

Macroscopic models - Heat flow and fluid flow analogies - Shock waves and bottleneck control approach.

Unit-III:

Microscopic models - Application of queuing theory - regular, random and Erlang arrival and service time distributions - Queue discipline - Waiting time in single channel queues and extension to multiple channels.

Unit-IV:

Linear and non-linear car following models - Determination of car following variables - Acceleration noise.

Unit-V:

Geographical Information System – Global Positioning System – Intelligent Transportation Systems - Area Traffic Control – Automatic Toll Collection – Smart Cards – Collision Detection System, Advanced Vehicle Control Systems (AVCS)

Text Books:

1. Drew, D.R., Traffic Flow Theory and Control, McGraw Hill., 1978.
2. TRB, Traffic Flow Theory - A Monograph, SR165, 1975

Subject Code	PAVEMENT CONSTRUCTION	L	T	P	C
2022191251		3	1*	0	3

Course Objectives:

The student will be taught

1. To understand concept of advanced methods of construction of rigid pavements.
2. To learn the concept of flexible pavement layers construction
3. To evaluate pavement condition by using suitable measures
4. To learn the design factors, mix design, construction control and quality control checks of stabilized pavement layers.
5. To identify hazardous locations and improve safety.
6. To understand the concept and of pavement management system.

Course Outcomes:

1. Carryout the construction of flexible pavements
2. Understand the construction of interlocking block pavements, quality control test, and construction of various types of joints.
3. Understand mix design, construction control and quality control checks of stabilised pavement layers.
4. Understand the structural and function failures and evaluation of pavements.
5. Develop pavement management systems.

Course Content:**Unit-I:****Pavement Construction:**

Preparation and Construction of Sub grade Soil, Sub base Courses, Base Courses, Bituminous Surface Courses, and Cement Concrete Surface Courses; MORTH specifications, Quality control.

Unit-II:**Pavement Inventories and Evaluation:**

Factors affecting Pavement Deterioration; Functional Condition Evaluation Techniques: Roughness Measurements, Identification of Uniform Sections, Serviceability Concepts: Visual & Ride Rating Techniques, Introduction to Psychometric and Psychophysical Scaling Techniques: Hutchinson's

Tracking Task Device Structural Condition Evaluation Techniques: NDT Procedures, Rebound Deflection, Deflection Bowl Measurement and Analysis, Destructive Testing: Remaining Life Concept, Asphaltic Institute's Equivalency Factors

Unit-III:

Evaluation of Pavement Safety:

Importance of Skid Resistance, Factors Affecting Skid Resistance, Skid Resistance Studies, Hydroplaning Reduction with Porous Overlays & Popcorn Friction Overlays; Deterioration Modelling Concepts: Factors Influencing Structural & Functional Condition Deterioration, Examples of Initiation and Progressing Deterioration Models, Use of Deterioration Models by HDM Software

Unit-IV:

Pavement Maintenance & Quality Control:

Routine, Responsive Maintenance Programmes, Periodic Maintenance, Special Repairs, Rehabilitation and Reconstruction, Objectives & Components of Pavement Maintenance Management System (PMMS), Stages in Implementing PMMS, Total Quality Management (TQM): Quality Assurance/Quality Control Concepts, Sampling, Tolerances and Controls Related to Profile & Compaction, Role of ISO 9000 in TOM.

Unit-V:

Pavement Management System (PMS):

Phases and Components of System's Approach, Relationship Between System Approach and PMS, Components and Activities of PMS, Inter relationships between the different components of PMS, Steps in Implementing PMS, Pavement Investment Planning Approaches: Index Ranking, Benefit Maximization & Cost Minimization Methods, Evaluating Alternative Strategies and Decision Criteria Using HDM Package.

Text Books:

1. RCC Haas, W. Ronald Hudson, et ai, Modern Pavement Management, Krieger Publishing Company
 2. ISTE Summer School Report on PMSS by Bangalore University, ISTE, New Delhi.
 3. Mohammed Y. Shahin, Pavement Management for Airports, Roads & Parking Lots, Chapman & Hall Publishers
 4. Instructor's Guide-Asphalt Institute, Asphalt Technology and Construction Practices, Educational series
 5. AF Stocks, Concrete Pavements, Elsevier Applied Science Publishers, New York
 6. Harold N. Atkins, Highway Materials, Soils & Concrete 3rd Edition, Prentice Hall
- MORTH, GOI, —Specifications for Roads & Bridge Works, New Delhi

Subject Code	AVIATION INFRASTRUCTURE AND PLANNING(Elective III)	L	T	P	C
2022191252		3	1*	0	3

Course Objectives:

The student will be taught

1. To develop a basic knowledge of the fundamental issues in Airport engineering.
2. To demonstrate the clear understanding of the airport components.
3. To build knowledge on basic principles in airport components geometric design.
4. To determine capacity and delays of airport
5. To build knowledge on critical factors consideration in airport grading and design.
6. To develop Knowledge on air traffic control aids

Course Outcomes:

1. Develop a basic knowledge of the fundamental issues in Airport engineering.
2. Demonstrate the clear understanding of the airport components.
3. Build knowledge on basic principles in airport components geometric design.
4. Build knowledge on airport components capacity and delays.
5. Build knowledge on critical factors consideration in airport grading and design.
6. Develop Knowledge on air traffic control aids.

Course Content:**Unit-I:****Growth and Characteristics of Airport and Aircraft:**

Growth of air transport, Airport organization and associations, Classifications of airports airfield components, airport traffic zones and approach areas. Aircraft Components, size turning radius, speed, airport characteristics

Unit-II:**Factors affecting capacity:**

Determination of runway capacity related to delay, gate capacity, and Taxiway Capacity Airport Site Selection, Runway length and width, sight distances, longitudinal and transverse grades, runway intersections, taxiways, clearances, aprons, numbering, holding apron, noise control, Problems.

Unit-III:

Airport Grading, Planning and Design of the Terminal area:

Operational concepts, space relationships and area requirements, vehicular traffic and parking at airports. Grading of airport area, hydrology.

Unit-IV:

Airport Drainage, Air Traffic Control and Aids:

Design of drainage systems, construction methods, layout of surface drainage and subsurface drainage system, Problems.

Unit-V:

Runways and taxiways markings, day and night landing aids, airport lighting, ILS and other associated aids.

Text Books:

1. Khanna, Arora and Jain. "Airport Planning and Design", SixthEd., Nem Chand and Bros., Roorkee, 2001
2. Rangwala, "Airport Engineering", 13thEd., Charotar Publishers, Gujarat, 2013
3. Virender Kumar and Satish Chandra, "Airport Planning and Design", First Ed., Galotia Publication Press, 1999
4. Robert Horenjeff, "Planning and Design of Airports", 2nd Ed., McGraw Hill Book Co. 1975

Subject code	PORT AND HARBOR ENGINEERING(Elective IV)	L	T	P	C
2022191253		3	1*	0	3

Course Objectives:

The student will be taught

1. To understand overall Port and Harbour Engineering and its impact.
2. To Key design harbour Characteristics and Elements like Groins, Breakwaters
3. To perceive with advanced topics like Deck and Fenders, Dolphins etc.
4. To extend knowledge on flow regime, lift force mechanism, bed load and suspended load etc.
5. To assess the design principles and construction of jetties.
6. To Build knowledge on design of offshore structures

Course Outcomes:

1. Develop an understanding of overall Port and HarborEngineering and its impact.
2. Build knowledge on the Key design Characteristics for design of Elements like Groins, Breakwaters
3. Perceive with advanced topics like Deck and Fenders, Dolphins etc.
4. Extend knowledge on flow regime, lift force mechanism, bed load and suspended load etc.
5. Assess the design principles and construction of jetties.
6. Build knowledge on design of offshore structures

Course Content:**Unit-I:****Sitting and Planning of Port Installations:**

History of port growth-Factors affecting growth of port. Classification of Harbors-Planning of port-SHIP characteristics as they relate to port planning-Need and economic justification of a port Volume and type of commerce-Hinter land studies and growth. Meteorological, Hydrographic and ocean graphic at a required for port design Hinterland studies, groins, bed waters.

Unit-II:**Sitting and Planning of Harbor Installations and Design of on-Shore Structures:**

Minimum maintenance and facilities for expansion. Size and shape of harbor and turning basin-Type, location and height of Breakwaters-Location and width of entrance to harbor - Depth of harbor and navigational channel-Number, location and type of docks or berths or jetties.

Unit-III:

Coastal Protection works–Seawall–Groins– Structural aspects–Sand dunes–Vegetation–Beach nourishment. Breakwaters–Types–Selection of site and type–effects on the beach–Stability of Rubble Structures. WharvesandJetties–Types–MaterialsofConstruction–DesignPrinciples–Deckforfenders.

Unit-IV:

Sediment Transport and Dredging

Mode of transport of sediment in open channel–Properties of sediment, critical velocity concept, critical shear stress. Regimes of flow, types of regimes, importance of regimes of flow,

Bed load :Du Boy’s, Meyer Peter Muller’s Equation, Einstein’s Theory of bed load movement, Grade and Albertson’s Equations. Suspended load: Diffusion–dispersion model, Lane’ sand Einstein’s approaches. Total load. Dispersion model, Diffusion, Critical velocity, Grade equation.

Unit-V:

Design of offshore structures

Introduction: Offshore definition, Purpose of Offshore Structures, Classification and Examples, Various types of Offshore Structures–Jacket Platforms, Semi submersibles, Tension Leg Platforms, Gravity Platforms Guyed Towers, Articulated Towers. Load Calculations: Environmental loads on offshore structures due to Wind, Wave, Current, Ice, Earth quake-Functional loads-Buoyant Forces-Installation forces, Soil structure interaction-Wave force calculation on a Jacket platform and Semi-submersible. Jacket Platforms, Semi submersibles, Tension Leg Platforms, Gravity Platforms

Text Books:

1. Garde,R.J.andRangaRaju,K.G.,MechanicsofSedimentTransportationandAlluvialstream problems,SecondEd.,WileyEasternLimited,46254/21,Daryaganj,NewDelhi.,1985
2. Graf,H.W.,HydraulicsofSedimentTransport,1st edition, McGraw HillBookCo.NewYork,1971

Reference Books:

1. A.D.F.Quinn, DockandHarbourEngineeringVol.I–IV,1963
2. Minikin, Winds,WaveandMaritimeStructures,1stedition,Griffin Publishers, 1950
3. AlanzoDeF.Quinn,Design&Constructionof portsandMarinestructures,2ndedition,McGrawHillBookCo.NewYork , 1972

Subject Code	SUSTAINABLE URBAN AND TRANSPORT DEVELOPMENT (Elective IV)	L	T	P	C
2022191254		3	1*	0	3

Course Objectives:

The student will be taught

Helps in understanding the basic concept of Sustainable Urban and Transport Development and its influence on region, city and built environment .

Course Outcomes:

Students would have learnt the importance of sustainable urban and transport planning and its benefits to the human community.

Course Content:**Unit-I:****Sustainable Urban and Transport Principles:**

Urban Environmental Sustainability, Urban Development, Urban Sustainable Development, Methods and Tools for Sustainable Appraisal, Sustainable Transportation – Principles, indicators and its implications

Unit-II:**Urban Planning and Environment 7:**

Environment and Resources, Sustainability Assessment, Future Scenarios, Form of Urban Region, Managing the change, Integrated Planning, Sustainable Development

Unit-III:**The Urban Built-In Environment 9**

Urban Form, Land Use, Compact Development, Principles of street design- complete streets, Transport Integrated Urban land use Planning, , Guidelines for Environmentally sound Transportation

Unit-IV:**Sustainable Transportation Modes Planning 11:**

Pedestrian – Planning Principles, Tools, Designs, Methods to measure success, Cycles- Planning Principles, Cycle Track Network, Crossings and intersections and junctions, Transit Planning, Road Side Infrastructure Planning

Unit-V:

Travel And Transport 10 :

Transport and Environment – Equity Principle, Accessibility, Mobility – Roads, Traffic, Public Transport, Business and Goods Traffic, Relationship to land use , Financing and Pricing – Economic Benefits of Sustainable Transportation

Textbook (s)

1. Joe Ravetz, City Region 2020 – "Integrated Planning for a Sustainable Environment, 2000.
2. George Godwin; "Traffic, "Transportation and Urban Planning"; Pitmen Press,Great Britain, 1981.
3. Sustainable Transportation and TDM – Planning the balances, Economic, Social and Ecological objectives; Victoria Transport Policy Institute, 2007.
4. UNCHS, Habitat, Cities in a Globalizing world, Global report on Human Settlement, 2001.
5. Tumlin Jeffrey, "Sustainable Transportation Planning- Tools for Creating Vibrant", Healthy and Resilient Communities, John Wiley & Sons, 2012.

Subject Code	ENVIRONMENTAL IMPACT ASSESSMENT(Elective IV)	L	T	P	C
2022191255		3	1*	0	3

Course Objectives:

The student will be taught

1. To impart knowledge on different concepts of environmental impact assessment.
2. To learn EIA Methodologies and criterion for selection of EIA methods
3. To avoid, minimize or balance the adverse significant bio-physical, social and other relevant effects of developmental projects.
4. To know the procedures for environmental Clearance's and audit.

Course Outcomes:

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

1. Able to prepare EIA reports.
2. Identify risks and impacts of the projects.
3. Selection of an appropriate EIA methodology.
4. Evaluation the EIA report.
5. Estimate the cost benefit ratio of the project.

Course Content:**Unit-I:**

Introduction: Environment and its interaction with human activities – Environmental imbalances –Attributes, Impacts, Indicators and Measurements - Concept of Environmental Impact Assessment (EIA),Environmental Impact Statement, Objectives of EIA, Advantages and Limitations.

Unit-II:

Environmental Indicators - Indicators for climate - Indicators for terrestrial subsystems - Indicators for aquatic subsystems - Selection of indicators - Socio-economic indicators - Basic information - Indicators for economy - Social indicators - Indicators for health and nutrition - Cultural indicators - Selection of indicators.

Unit-III:

Environmental issues in water resource development - Land use - Soil erosion and their short and long term effects - Disturbance and long term impacts - Changes in quantity and quality of flow - Sedimentation - Environmental impact assessment of water resource development structures - Case studies, Water Quality Impact Assessment - Attributes, Water Quality, Impact Assessment of Water. Resources Projects, Data Requirements of Water Quality Impact Assessment for Dams, Impacts of Dams on Environment, Case Studies.

Unit-IV:

Environmental Issues in Industrial Development: On-site and Off-site impacts during various stages of industrial development, Long term climatic changes, Greenhouse effect, Industrial effluents and their impact on natural cycle, Environmental impact of Highways, Mining and Energy development

Unit-V:

Methodologies for Carrying Environmental Impact Assessment: Overview of Methodologies Ad hoc, Checklist, Matrix, Network, Overlays, Benefit Cost Analysis, Choosing A Methodology, Review Criteria.

Text Books:

1. Jain, R.K., Urban, L.V., Stracy, G.S., (1991), —Environmental Impact Analysis, Van Nostrand Reinhold Co., New York
2. Rau, J.G. and Wooten, D.C., (1996), —Environmental Impact Assessment, McGraw Hill Pub. Co., New York
3. UNESCO, (1987), —Methodological Guidelines for the Integrated Environmental Evaluation of Water Resources Development, UNESCO/UNEP, Paris
4. Canter, L.W., (1997), —Environmental Impact Assessment, McGraw Hill Pub. Co., New York

Subject Code	TRAFFIC ENGINEERING LABORATORY	L	T	P	C
2022191210		0	0	3	2

Course Outcomes:

The students will be able to

1. Build knowledge on quality behavior of road aggregates.
2. Develop Knowledge on types of bitumen and their quality behavior.
3. Develop knowledge of quality behavior of sub-grade soils.
4. Utilize aggregate and bitumen properties in pavement design.
5. Examine the unevenness of existing pavements.

Develop Knowledge on mix design of Flexible pavements

List of Experiments:

1. Volume Studies – Straight Roads and at Intersections
2. Speed Studies - Spot Speed Studies by Stop Watch, Enoscope and Radar Speed Meter
3. Journey Time and Delay Studies - Floating Car Method
4. Parking Surveys and Parking Turnover Studies
5. Study of Gaps and Lags – Critical Gaps and Lags at Intersections
6. Gap Acceptance Study of Uncontrolled Intersection
7. Delay Measurement at Signalised and Unsignalised Intersections
8. Traffic Diversion Analysis using diversion curves.
9. Videography Survey.
10. Road safety Audit.
11. Mini Project based on above studies.

List of Mini-Projects

1. Conduct Volume studies on all Major District Roads of a town/city.
2. Conduct Speed studies on all Major District Roads of a town/city.
3. Conduct Speed and Delay studies on all Major District Roads of a town/city.
4. Conduct Parking studies at all the busy locations of a town/city.
5. Study the critical gaps and lags at all intersections of a town/city.

6. Prepare thematic maps of the existing alignments of all Major District Roads of a town/city.

List of Equipment:

1. Video Cameras
2. Photron Tripod Stands
3. JUNO Handheld GPS Window Mobile
4. Handheld GPS Mapping System Trimble GeoXT- 2008 series
5. V-Box with 4 camera Data Acquisition system
6. Bushnell Speedster III Radar Gun w/ Speeds from 10 to 200MPH
7. Stop Watches

Text Books:

1. L.R.Kadiyali, Highway Engineering, Fifth edition, Khanna Publishers, 2011
2. S.K.Khanna&C.E.Justo, Highway Engineering, Nem Chand& Bros., Publisher, 2012
3. ArcMap10.2 Software

Subject Code	TRANSPORTATION SIMULATION LAB	L	T	P	C
2022191211		0	0	3	2

Course Outcomes:

The students will be able to

1. Build knowledge on quality behavior of road aggregates
2. Develop Knowledge on types of bitumen and their quality behavior
3. Develop knowledge of quality behavior of sub-grade soils
4. Utilize aggregate and bitumen properties in pavement design
5. Examine the unevenness of existing pavements
6. Develop Knowledge on mix design of Flexible pavements

List of Experiments:

1. Intersection designs
2. Signal Design.
3. Origin and Destination Studies
4. Computer Software: Principles of.
5. Traffic Simulation studies using VISSIM.
6. Traffic modeling studies using VISUM.
7. Accident Studies

List of Mini-Projects

1. Conduct Volume studies on all Major District Roads of a town/city.
2. Conduct Speed studies on all Major District Roads of a town/city.
3. Conduct Speed and Delay studies on all Major District Roads of a town/city.
4. Conduct Parking studies at all the busy locations of a town/city.
5. Study the critical gaps and lags at all intersections of a town/city.
6. Prepare thematic maps of the existing alignments of all Major District Roads of a town/city.

List of Equipment:

1. Video Cameras
2. Photron Tripod Stands
3. JUNO Handheld GPS Window Mobile
4. Handheld GPS Mapping System Trimble GeoXT- 2008 series
5. V-Box with 4 camera Data Acquisition system
6. Bushness Speedster III Radar Gun w/ Speeds from 10 to 200MPH
7. Stop Watches

Text Books :

4. L.R.Kadiyali, HighwayEngineering,Fifth edition, KhannaPublishers, 2011
5. S.K.Khanna&C.E.Justo,HighwayEngineering, NemChand& Bros.,Publisher, 2012
6. ArcMap10.2 Software

Subject code	CONSTITUTION OF INDIA	L	T	P	C
2000191230		3	0	0	0

Course Overview: This course introduces students to the Constitution of India. It begins by providing an overview of the history of the making of Indian Constitution. It then discusses the preamble and the basic structures of the Constitution. The fundamental rights, duties and the directive principles of state policy will be discussed thoroughly, followed by a discussion of the legislature, the executive and the judiciary. Some of the important sections of the Constitution that have influenced the history of India since independence will also be taken up for study. These include emergency powers and special provisions.

Course Objectives:

1. To Enable the student to understand the importance of constitution
2. To understand the structure of executive, legislature and judiciary
3. To understand philosophy of fundamental rights and duties
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
5. To understand the central and state relation financial and administrative

	Course outcome	Bloom's cognitive level	PO
CO1	Have general knowledge and legal literacy and thereby to take up competitive examinations.	Understanding	PO-6 PO-8 PO-9
CO2	Understand state and central policies, fundamental duties.	Understanding	PO-6 PO-8 PO-9
CO3	Understand Electoral Process, special provisions.	Understanding	PO-6 PO-8 PO-9
CO4	Understand powers and functions of Municipalities, Panchayats and Cooperative Societies	Understanding	PO-6 PO-8 PO-9

Unit-I:

No. of lecture hours: 6

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties

Outcome: After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT II:

No. of lecture hours: 6

Union Government and its Administration Structure of the Indian Union. President: Role, power and position, PM and Council of ministers, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions

Outcome: After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

Activity: role play of model parliament

Unit-III:

No. of lecture hours: 6

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

Outcome: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariate

Activity: Quiz role play of model assembly.

Unit-IV:

No. of lecture hours: 6

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role - CEO of Municipal Corporation Pachayati Raj: Functions Zila Panchayat, CEO Zila Panchayat

Outcome: After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Mayor and elected representatives of Municipalities
- Evaluate Zilla Panchayat block level organisation

Activity: Debate on pros and cons of local governance

Unit-V:

No. of lecture hours: 6

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission;

Outcome: After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

Activity: Debate on election system in India

Text Books:

1. Civics, Telugu Academy

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

Subject code	MINI PROJECT WITH SEMINAR	L	T	P	C
2022191270		0	0	4	2

For Mini Project with Seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee (PRC) consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department. For Mini Project with Seminar, there **will be only internal evaluation** of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

Mini project report is evaluated for 100 marks.

- a) Assessment by the supervisor /guide for 30 marks
- b) Assessment by PRC for 40 marks (20 marks x 2 reviews)
- c) Seminar presentations for 30 marks (department level committee assessment)

M. TECH. - TRANSPORTATION ENGINEERING

(CIVIL ENGINEERING)

II Year – I Semester

II Year – I Semester

Course Code	Highway Safety Engineering	L	T	P	C
2022192151		3	1*	0	3

Course Objectives:

The student will be taught

1. Explain the causes of accidents, statistical measures of accident data analysis and computer application □ □ in data analysis. □
2. Explain different parameters responsible for providing road safety in the construction of newroads. □
3. Explain road reconstruction principle and improvement of road considering the different components of road and intersections. □
4. Explain road safety audit principle and procedure, various traffic management techniques and their effectiveness

COURSE CONTENT**Unit-I:****Introduction to safety:**

Road accidents, Trends, causes, Collision diagrams; Highway safety; Human factors and road user limitations; Speed and its effect on road safety; Vehicle factors; Highway safety in India. Multi-causal dynamic systems approach to safety; Crash Vs Accident; Road safety improvement strategies; Elements of a road safety plan, Safety data Needs; Safe vehicle design

Unit-II:**Statistical Interpretation and Analysis of Crash Data:**

Before-after methods in crash analysis, Recording of crash data; Accident Investigation and Analysis; Statistical testing and the role of chance; Black Spot Identification and Investigations, Case Studies

Unit-III:**Road Safety Audits:**

Key elements of a road safety audit, Road Safety Audits & Investigations, Work zone safety audit; Crash investigation and analysis, Methods for identifying hazardous road locations, Case Studies

Unit-IV:**Crash Reconstruction:**

Describe the basic information that can be obtained from the roadway surface, Understand basic physics related to crash reconstruction, speed for various skid, friction, drag, and acceleration scenarios, variables involved in jump and flip crashes, variables involved in pedestrian crashes, Case Studies.

Unit-V:

Mitigation Measures:

Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety; Safety in urban areas; Public transport and safety; Road safety policy making, Stakeholders involvement; Road safety law.

Textbook (s)

References:

1. AthelstanPopkess, Traffic Control and Road Accident Prevention, Chapman and Hall, 1997 (Digitized2008)
2. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (reprinted 2002).
3. GeetamTiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press, 2016.
4. Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999.
5. J. Stannard Baker, Traffic Collision Investigation, Northwestern University Center for Public Safety, 2002.
6. Ken W. Ogden, Safer Roads: A Guide to Road Safety Engineering. Avebury Technical,1996.
7. Lynn B. Fricke, Traffic Crash Reconstruction, Second Edition, Northwestern University Center for Public Safety, 2010.
8. Rune Elvik and TrulsVaa, The Handbook of Road Safety Measures, Elsevier, 2004.
9. 11.IRC:SP:55-2014 Guidelines of Traffic Management in work zones
10. 12. IRC:SP:88-2019 Manual on Road safety audit

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

1. Understand causes of accidents, statistical measures of accident data analysis and computer application □ □ in data analysis.□
2. Apply road safety technique in the construction of newroads.□
3. Explain road reconstruction principle and improvement of road considering the differentcomponents of road and intersections.□
4. Explain road safety audit principle and procedure, various traffic management techniques andtheir effectiveness

II Year – I Semester

Course Code	<i>COMPUTATIONAL TECHNIQUES IN TRANSPORTATION ENGINEERING</i>	L	T	P	C
2022192152		3	1*	0	3

Course Objectives:

The student will be taught

1. To be introduced the systems approach.
2. To learn the fundamentals of simulation and the GPSS language.
3. To be introduced to advanced computational techniques such as GA and ANN

COURSE CONTENT**Unit-I:**

Introduction to systems approach - Typical transportation systems - Mathematical models. Fundamentals of simulation - Monte Carlo method - Continuous and discrete models - Simulation languages.

Unit-II:

Probability concepts - Random numbers - Pseudo random generators - Arrival patterns - Service time distributions – Manual simulation of simple queuing system

Unit-III:

GPSS Fundamentals - Creating and moving transactions - Queues and facilities - Event scheduling – Standard numerical attributes – Parameters and savevalues - Functions - Priority - Preemption - Collection of statistics - Report preparation. Applications of GPSS - Simple queuing problems - Inventory problems - Simulation level crossings - Traffic signals. Analysis of simulation results - Model validation - Replication of random conditions - Time series analysis

Unit-IV:

Genetic Algorithm - Terminology in GA – Strings, Structure, Parameter string - Data Structures – Operators - Algorithm – Application in Transportation. Fuzzy Logic

Unit-V:

Artificial Neural Networks - Basics of ANN – Topology - Learning Processes - Supervised and unsupervised learning. Least mean square algorithm, Back propagation algorithm - Applications

Textbook (s)

1. J. S. Arora, Introduction to Optimum Design, McGraw Hill International Ed., NY, 1989
2. K. Deb, Optimization for Engineering Design: Algorithms and Examples, 2nd Ed., PHI, 1995
3. S. S. Rao, Engineering Optimization: Theory and Practice, New Age International (P) Ltd., 2001
4. J.M. Zurada, .Introduction to artificial neural systems., Jaico Publishers, 2006

Reference (s)

1. D. E. Goldberg, Genetic Algorithms in Search and Optimization, Pearson publication, 1990
2. J. R. Koza, Genetic Programming, MIT Press, 1993
3. K. Deb, Multi-Objective Optimization Using Evolutionary Algorithms, Wiley, 200
4. David E. Goldberg, Genetic Algorithms in Search, Optimisation and Machine Learning, Addison-Wesley, 1989

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

1. A working knowledge of simulation and GPSS programming
2. A good understanding of GA applications
3. The ability to apply ANN

II Year – I & II Semester

**(DISSERTATION)
PHASE – I & PHASE - II**

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee (PRC).

Continuous assessment of Dissertation-I and Dissertation-II during the semester(s) will be monitored by the PRC.

DISSERTATION – I:

Dissertation- I/Industrial project: In Dissertation- I, literature review, design calculations and a prototype model are to be prepared within 16 weeks.

In case of Industrial project, students have to complete coursework related to the particular semester through MOOCs

The evaluation of Dissertation-I/Industrial project will be purely internal for **100 marks** based on the presentation of literature review, design calculations and demonstration of prototype model.

DISSERTATION– II:

In **Dissertation – II**, experimentation, analysis (analytically or using modern software tools), results & discussion and conclusions are to be prepared and submitted.

A candidate shall submit his status report after each review. Minimum three reviews at PRC level shall be conducted in a gap of one month each for both Dissertation – I & II.

Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The Board shall jointly evaluate the candidate's work for a maximum of **100 marks**.