SYLLABUS

(With effect from 2024 -25)

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕ ವರ್ಷ 2024-25)

Bachelor Degree
In
Civil Engineering

VII & VIII Semester

Out Come Based Education
With
Choice Based Credit System

[National Education Policy Scheme]

P.E.S. College of Engineering, Mandya - 571 401, Karnataka

[An Autonomous Institution affiliated to VTU, Belagavi,
Grant – in – Aid Institution (Government of Karnataka),
Accredited by NBA (All UG Programs), NAAC and Approved by AICTE, New Delhi]

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ
ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ
(ವಿ.ಟಿ.ಯು, ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

Ph : 08232- 220043, Fax : 08232 – 222075,Web : www.pescemandya.org

PES College of Engineering

VISION

PESCE shall be a leading institution imparting quality engineering and management education, developing creative and socially responsible professionals

MISSION

- Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching -learning practices
- Impart engineering and managerial skills through competent and committed faculty using Outcome Based Educational curriculum
- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs
- Promote research, product development and industry-institution interaction.

QUALITY POLICY

Highly committed in providing quality, concurrent technical education and continuously striving to meet expectations of stake holders.

CORE VALUES

***P**rofessionalism*
***E**mpathy*
***S**ynergy*
***C**ommitment*
***E**thics*

DEPARTMENT OF CIVIL ENGINEERING

VISION

To attain Excellence in imparting quality civil engineering education to meet the societal needs.

MISSION

1. Impart civil engineering and managerial skills with state of art infrastructure, competent and committed faculty using outcome based educational curriculum.
2. Promote research, project management and consultancy.
3. Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.

Programme Education Objectives (PEOs)

Graduates will be able to

1. Apply technical competence in the field of Civil Engineering with a strong background in basic science and mathematics.
2. Analyse and interpret data to design or evaluate civil engineering systems to satisfy societal needs with the use of modern tools including higher education.
3. Function effectively as an individual and or to work in a team on multispecialized Civil Engineering projects with professional ethics and effective communication skills inculcating the habit of life-long learning.

Programme Specific Outcomes (PSOs)

The Program Specific Outcomes have been derived from the PSC's defined by ASCE. By the time of graduation, Civil Engineering students will be able to:

PSO1: Apply knowledge of basic science to analyze and solve problems in the core area of Civil Engineering such as Structural, Geotechnical, Transportation, Environmental, Hydraulics and Water resources engineering.

PSO2: Analyze, Plan, design, quality assessment and cost estimate of Civil Engineering structures with professional ethics.

PSO3: Work in a consulting organization or can be an entrepreneur to investigate and supervise Civil Engineering structures using modern tools and technology to provide sustainable solutions to meet the societal needs.

Bachelor of Engineering (VII –Semester)										
Sl. No.	**Course Code**	**Course Title**	**Teaching Department**	**Hrs / Week**			**Credits**	**Examination Marks**		
				L	**T**	**P**		**CIE**	**SEE**	**Total**
1	P21CV701	Pre stressed concrete structures	CV	3	-	-	3	50	50	100
2	P21CV702X	**Professional Elective -IV**	CV	3	-	-	3	50	50	100
3	P21CV703X	**Professional Elective - V**	CV	3	-	-	3	50	50	100
4	P21CV704	Quantity Survey and Contract Management (Integrated)	CV	3	-	2	4	50	50	100
5	P21CV705	Research Methodology, Thesis Writing and IPR	CV	3	-	-	3	50	50	100
6.	P21CV706	Project Work Phase – I	CV	-	-	-	4	100	-	100
	Total						**20**			

List of Electives

Professional Elective -IV			**Professional Elective - V**		
Sl. No.	**Course Code**	**Course Title**	**Sl. No.**	**Course Code**	**Course Title**
1	P21CV7021	Design of Bridges	1	P21CV7031	Advance Design of Structures
2	P21CV7022	Traffic Engineering	2	P21CV7032	Urban Transport Planning
3	P21CV7023	Applied Geotechnical Engineering	3	P21CV7033	Advanced Foundation Design
4	P21CV7024	Environmental Impact Assessment	4	P21CV7034	Open Channel Hydraulics

Bachelor of Engineering (VIII –Semester)										
Sl. No.	**Course Code**	**Course Title**	**Teaching Department**	**Hrs / Week**			**Credits**	**Examination Marks**		
				L	**T**	**P**		**CIE**	**SEE**	**Total**
1	P21XX801	Self-Study Course	CV	-	-	-	2	100	-	100
2	P21INT802	Research / Industry Internship – III	CV	-	-	-	6	-	100	100
3	P21XX803	Project Work Phase – II	CV	-	-	-	8	100	100	200
Total							**16**			

PRE STRESSED CONCRETE STRUCTURES

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – VII

Course Code:	**P21CV701**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3: 0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Understand the basic concept of PSC
- Analyse PSC beams of different cross sections under flexure
- Determine the losses due to prestress and PSC member deflection
- Calculate flexural and shear strength and design shear reinforcements
- Know the anchorage length, stress distribution in end block and design of end block

UNIT – I	**Introduction**	**08 Hours**

Definition of pre stressing and pre stressed concrete, comparison, advantages and disadvantages of PSC over RCC, High strength concrete and steel, tensioning devices, Pre-tensioning and Post-tensioning methods, Cable profiles, Load balancing concept, Centre of thrust, pressure line.

Self-study component:	Students shall visit to the construction site or nearest factory observe the tensioning of pre tensioned and post-tensioned members, prepare a report, and submit.

UNIT – II	**Analysis of Sections**	**08 Hours**

Stresses in concrete due to pre-stress and external loads for different types of cross sections at transfer of pre stress and working load conditions.

Self-study component:	Students shall visit to the construction site or nearest factory observe the tensioning of pre tensioned and post-tensioned members, collect the details of type of PSC sections, also sheaths and ducts, prepare a report, and submit,

UNIT – III	**Losses of Pre-Stress and Deflections**	**08 Hours**

Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force. Deflections of pre-stressed members, Short term and long term deflections - under transfer loads and due to different cable profiles. Deflections limits as per IS 1343-2012.

Self-study component:	Students shall collect the details on methods of reducing deflection, prepare a report, and submit.

UNIT – IV	**Limit State of Collapse**	**08 Hours**

Flexure: IS requirements for ultimate flexural strength of sections
Shear: IS requirements for shear resistance of sections, design of shear reinforcement

Self-study component:	Students shall collect the details of failure modes under flexure and shear from text books or internet, prepare a report, and submit.

UNIT - V	Design of End Blocks	08 Hours

Transmission of prestress in pre tensioned members, transmission length, anchorage zone stresses in post-tensioned members, end blocks, and design of an end block by the IS code method.

Self-study component:	Students shall collect the details of anchorage zone reinforcements, prepare a report, and submit

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the course topics	Bloom's Taxonomy Level	Level Indicator
CO1	**Understand** the basic concept of prestressed concrete.**(PO2, PO3, PO4)**	Understanding	L2
CO2	**Analyze** PSC members for flexure and shear**(PO2, PO3, PO4)**	Analyzing	L3
CO3	**Solve** PSC members and compute various losses, deflections, shear strength and flexural strength.**(PO1, P4, PO5)**	Applying	L3
CO4	**Analyze** and design PSC members for shear and design of end block as per codal provisions. **(PO3, PO4,PO7, PO8, PO12)**	Analyzing	L4

Text Book:

1. N Krishna Raju, "Pre - stressed Concrete", Tata Mcgraw Hill, New Delhi
2. N Rajagopalan, "Pre - stressed Concrete", Narosa Publishing House, New Delhi
3. Praveen Nagarajan, "Prestressed Concrete Design", Pearson Education India

Reference Book:

1. Lin T Y and N H Burns, "Design of Pre - stressed Concrete Structures", John Wiley and Sons, New York
2. G S Pundit and S P Gupta, "Pre - stressed Concrete", C B S Publishers, New Delhi
3. R.P. Johnson: Composite Structure of Steel and Concrete (Volume 1), Blackwell Scientific Publication (Second Edition), U.K., 1994
4. Recommendations of NBC-2016.

Web and Video link(s):

1. https://archive.nptel.ac.in/courses/105/106/105106118/
2. https://www.coursehero.com/file/73943695/NPTEL-Prestress-concrete-contentpdf/

E-Books/Resources:

1. https://www.google.co.in/books/edition/Prestressed_Concrete/9EKK3tzzjRsC?hl=en&gbpv=1&dq=prestressed+concrete&printsec=frontcover
2. https://www.google.co.in/books/edition/Prestressed_Concrete/S_d5DwAAQBAJ?hl=en&gbpv=1&dq=prestressed+concrete&printsec=frontcover
3. https://www.google.co.in/books/edition/PRESTRESSED_CONCRETE/g5kPDAAAQBAJ?hl=en&gbpv=1&dq=prestressed+concrete&printsec=frontcover
4. https://www.google.co.in/books/edition/Design_of_Prestressed_Concrete_Structure/yhdwuwEACAAJ?hl=en

COURSE ARTICULATION MATRIX (PRE STRESSED CONCRETE STRUCTURES - P21CV701)															
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	2	2									1	2	2
CO2		2	2	2									1	2	2
CO3	1			2	2								1	2	2
CO4			2	2			2	2				2	1	2	2
3-HIGH, 2-MEDIUM, 1-LOW															

DESIGN OF BRIDGES

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – VII

Course Code:	**P21CV7021**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3:0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Apply basic knowledge of mathematics, science and engineering in the design of bridges.
- Apply procedural knowledge of definition, components of bridge, site selection for bridges, classification of bridges, hydraulic design.
- To identify, formulate and solve engineering problems on design of bridges.
- Apply procedural knowledge to design bridges like slab culvert, box culvert & T beam bridges subjected to various load combinations.

UNIT – I	**Introduction to Bridges**	**8 Hours**

Definition, components of bridge, classification of bridges, Site Selection for Bridges, Forces to be considered for the design of bridges, Hydraulic Design: Design discharge- Afflux, Natural waterway- Linear waterway – Economic span.

Self-Study Component:	The Student shall visit the nearby bridge site and understand the component parts of bridges, number of spans etc.

UNIT – II	**Substructure, Foundations and Bearings**	**8 Hours**

Definition of pier and abutment behaviour of pier and abutment, loads to be considered on pier and abutment, types of foundations for pier and abutment and loads to be considered on them, Importance of bridge bearings, sketches of different types of bearings

Self-Study Component:	Students shall visit a typical bridge construction site and identify the substructures and type of foundation

UNIT – III	**RCC Slab Culvert**	**8 Hours**

Introduction, Behavior of slab culvert, Design and detailing of slab culvert subjected to class AA tracked vehicle, Class AA wheeled vehicle and 70R loading

Self-Study Component:	Design Components of skew slab culvert and detailing

UNIT – IV	**RCC Box Culvert**	**8 Hours**

Introduction, Behavior of Box girder bridges, Design of single cell box culvert subjected to class AA tracked vehicle and class AA wheeled vehicle.

Self-Study Component:	Design component of pipe culvert and structural detailing of box and pipe culvert.

UNIT – V	**T-Beam Bridge**	**8 Hours**

Introduction, behavior of T-beam bridge, Design of deck slab by using Piegeaud's Curves and design of longitudinal and cross girders using Courbon's method subjected to IRC Class-AA tracked vehicle.

Self-Study Component:	Flyovers: Introduction, Advantages and disadvantages, types of flyover bridges

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Level Indicator
CO1	**Demonstrate** the components of bridge and define the load flow mechanism **(PO1, PO2,PSO1)**	Applying	L3
CO2	**Analyze** the types of abutments and piers - compute the forces acting on them.**(PO1, PO2,PSO1,PSO2)**	Analyzing	L3
CO3	**Design** Slab culvert & Box culvert as per given IRC specifications. **(PO1, PO2, PO3,PSO1,PSO2)**	Creating	L6
CO4	**Design** T-beam bridge as per given IRC specifications. **(PO1, PO2, PO3,PSO1,PSO2)**	Creating	L6

Text Book:

1. Johnson D Victor, "Essentials of Bridge Engineering", Oxford & IBH Publishing Co New Delhi.
2. Krishna Raju N, "Design of Bridges", Oxford & IBH Publishing Co New Delhi.
3. Jagdeesh T. R., Jayaram M. A., "Design of Bridge Structures, Prentice Hall of India Pvt. Ltd.", New Delhi, 2003.

Reference Book:

1. SP Bindra, Dhanpat Rai & Sons, "Principles and Practice of Bridge Engineering", New Delhi.
2. IRC 6–2016 Standard Specifications and Code of Practice for Road Bridges Section II Loadsand Stresses, The Indian Road Congress, New Delhi.
3. IRC 21 – 2000 Standard Specifications and Course Code of Practice for Road Bridges Section III Cement Concrete (Plain and reinforced) The Indian Road Congress New Delhi.
4. IS 456 - 2000 Indian Standard Plain and Reinforced Concrete Course Code of Practice (Fourth Revision) BIS, New Delhi.
5. Raina V. K., "Concrete Bridge Practice: Construction and maintenance and rehabilitation", Tata Mc Graw Hill Publishing Company, New Delhi.

Web and Video links:

1. Reinforced concrete road bridges: https://nptel.ac.in/courses/105105216
2. Bridge Engineering: https://onlinecourses.nptel.ac.in/noc22_ce63/preview
3. Fundamentals of bridge design: https://www.udemy.com/course/fundamentals-of-bridge-designyour-way-to-be-bridge-designer/
4. Culvert design considerations: https://knowledge.civilgeo.com/knowledge-base/culvert-design-considerations/
5. Tutorial for Engineering design of highways and bridges: https://www.roadbridgedesign.com/

E-Books/Resources:

1. https://www.google.co.in/books/edition/Fracture_Mechanics/uAWDAAAQBAJ?hl=en&gbpv=1&dq=theory+of+elasticity+e+book+l+s+srinath&printsec=frontcover
2. https://ascelibrary.org/journal/jbenf2
3. https://www.fhwa.dot.gov/engineering/hydraulics/pubs/hif12018.pdf.
4. https://www.steelconstruction.info/Bridges_-_initial_design.

COURSE ARTICULATION MATRIX
(DESIGN OF BRIDGES - P21CV7021)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											3		
CO2	1	3											1	3	
CO3	1	2	3										1	2	
CO4	1	2	3										1	2	

3-HIGH, 2-MEDIUM, 1-LOW

TRAFFIC ENGINEERING

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – VII

Course Code:	**P21CV7022**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3: 0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Understand fundamental knowledge of traffic engineering, scope and its importance.
- Describe basic techniques for collecting and analyzing traffic data, diagnosing problems, designing appropriate remedial treatment, and assessing its effectiveness.
- Apply probabilistic and queuing theory techniques for the analysis of traffic flow situations and emphasis the interaction of flow efficiency and traffic safety.
- Understand and analyze traffic issues including safety, planning, design, operation and control.
- Apply intelligent transport system and its applications in the present traffic scenario.

UNIT – I	**Traffic Planning and Characteristics**	**8 Hours**

Definition and scope of traffic engineering, Road Characteristics: Road user characteristics, PIEV theory, Vehicle Performance characteristics, Fundamentals of Traffic Flow, Urban Traffic problems in India and remedies, Sustainable approach: land use and transport.

Self-study component:	Integrated planning, modal integration.

UNIT – II	**Traffic Surveys**	**8 Hours**

Speed, journey time and delay surveys, Vehicles Volume Survey including non-motorized transports, Methods and interpretation, Origin Destination Survey, Methods and presentation, Parking Survey, Accident analysis-Methods, interpretation and presentation, Level of service-Concept.

Self-study component:	Statistical applications in traffic studies and traffic forecasting.

UNIT – III	**Traffic Design and Visual Aids**	**8 Hours**

Intersection Design- channelization, Rotary intersection design, Signal design, Coordination of signals, Grade separation, Traffic signs including VMS, Significant roles of traffic control personnel, Networking pedestrian facilities and cycle tracks, road side development.

Self-study component:	Road markings, Analysis of bus bay.

UNIT – IV	**Traffic Safety and Environment**	**8 Hours**

Road accidents: Causes, effect, prevention and cost; Traffic and environment hazards, Air and Noise Pollution, causes, abatement measures, Promotion and integration of public transportation, Promotion of non-motorized transport.

Self-study component:	Accident Spot Analysis, Street lighting, Green highway.

UNIT – V	**Traffic Management**	**8 Hours**

Area Traffic Management System, Traffic System Management (TSM) with IRC standards, Traffic Regulatory Measures, Travel Demand Management (TDM), Direct and indirect methods, All segregation methods- Coordination among different agencies, Intelligent Transport System for traffic management, enforcement and education.

Self-study component:	Congestion and parking pricing. Bengaluru Traffic Police Management Software and Command Centre

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Level Indicator
CO1	**Understand** the human and vehicular characteristics in traffic engineering design. **(PO1, PO7, PSO1)**	Understanding	L2
CO2	**Analyze** different types of traffic surveys and analysis of collected data. **(PO3, PO4, PO5, PSO2)**	Analyzing	L4
CO3	**Understand** the concept of traffic signal design and influence of traffic on environment. **(PO1,PO3,PO7, PSO2)**	Understanding	L2
CO4	**Understand** the basic knowledge of transportation management and traffic safety. **(PO4, PO5, PO11,PSO3)**	Understanding	L2

Text Book:

1. Traffic Engineering and Transport Planning: Kadiyali. L.R. Khanna Publishers, Delhi, 2013.
2. Highway Engineering: S.K. Khanna, C.E.G Justo, and A.Veeraragavan, Nem Chand and Bros, Roorkee, Revised 10th Edition.
3. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.
4. Highway Traffic Analysis and Design: Salter. R.I and Hounsell N.B, Macmillan Press Ltd.
5. Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and Design", Macmillan Press Ltd.1996.

Reference Book:

1. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.
2. Fred L. Mannering, Scott S. Washburn and Walter P. Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi,2011.
3. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010.
4. SP: 43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" for Urban Areas, 1994.
5. John E Tyworth, "Traffic Management Planning, Operations and control", Addison Wesly Publishing Company, 1996.
6. Hobbs.F.D."Traffic Planning and Engineering", University of Brimingham, Peragamon Press Ltd, 2005.

Web and Video links:

1. Traffic Stream Characteristics: https://www.youtube.com/watch?v=3XaTwQIugJ4
2. Traffic Studies : Part – I: https://www.youtube.com/watch?v=0yzgMc110po
3. Traffic Studies : Part – II: https://www.youtube.com/watch?v=1TKhZ90lngs

4. Highway Capacity and Level of Service: https://www.youtube.com/watch?v=pMcOgiWlGDU
5. Intersection Control and Signalization: https://www.youtube.com/watch?v=Kglgk3aVASE
6. Poisson Distribution for Traffic Engineers: https://www.youtube.com/watch?v=YvD_gIqy7-g

E-Books/Resources:

1. https://www.researchgate.net/publication/271618784_Research_on_Urban_Road_Traffic_Congestion_Charging_Based_on_Sustainable_Development
2. https://iopscience.iop.org/article/10.1088/1757-899X/1006/1/012002
3. https://www.hindawi.com/journals/jat/2022/7239464/
4. https://www.sciencedirect.com/journal/construction-and-building-materials
5. https://www.sciencedirect.com/science/article/pii/S2095756422000174

COURSE ARTICULATION MATRIX
(TRAFFIC ENGINEERING – P21CV7022)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2						3						2		
CO2			2	2	2									2	
CO3	3		2				2							2	
CO4				2	2						2				2

3-HIGH, 2-MEDIUM, 1-LOW

APPLIED GEOTECHNICAL ENGINEERING

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – VII

Course Code:	**P21CV7023**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3: 0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Gain the knowledge of Science and Geology to compute engineering properties of soil.
- Sketch the flow nets for soil structures and Evaluate stresses in soils for settlement and stability analysis.
- Analyze earth pressure and stability of slopes for design of earth retaining structures.
- Evaluate and interpret bearing capacity and settlement data for design of footings.

UNIT – I	**Sub-Surface Exploration, Drainage and Dewatering**	**8 Hours**

Sub-Surface Exploration: Importance of exploration program, Methods of exploration: Boring, geophysical methods- Electrical resistivity and Seismic refraction methods. Types of samples, undisturbed, disturbed and representative samples Samplers, sample disturbance, area ratio, Recovery ratio, clearance ratios, Typical bore log. Number and depth of borings for various civil engineering structures.

Drainage and Dewatering: Determination of ground water level by Hvorselev's method. Dewatering- Ditches and sumps, well point system, Shallow well system, Deep well system, Vacuum Method, Electro- Osmosis method.

Self-study component:	Sub-surface sounding tests, Stabilization of boreholes, Soil exploration report.

UNIT – II	**Stresses in Soils and Flow nets**	**8 Hours**

Stresses in Soils: Boussinesq's and Westergaard's theories for concentrated and circular loads. Pressure bulb (isobar), Newmark's Chart, Comparison of Boussinesq's and Westergaard's analysis.

Flow nets: Characteristics and uses of flow nets, Determination of phreatic line in earth dams with and without filter, Piping and protective filter graded filter.

Self-study component:	Boussinesq's equation for rectangular, line and strip loads (No derivations), contact pressure, Methods of drawing flow nets for Dams and sheet piles,

UNIT – III	**Lateral Earth Pressure and Effective Stress Concept**	**8 Hours**

Effective Stress Concept – Total and effective stresses, Pore water pressure, Terzaghi's effective stress equation and its limitations,

Lateral Earth Pressure: Active and passive earth pressures, Earth pressure at rest, Earth pressure coefficient. Earth pressure theories- Rankine's and Coulomb's –assumptions and limitations), lateral earth pressure in cohesive and cohesion less soils and Numerical problems. Graphical solutions for active earth pressure (cohesion less soil only) –Culmann's and Rebhann's methods

Self-study component:	Comparison of Rankine's and Coulomb's theories, Earth pressure distribution. Capillary phenomena, Quick sand phenomena.	
UNIT – IV	**Stability of Earth Slopes**	**8 Hours**

Stability of Earth Slopes: Types of slopes, causes of failure of slopes and type of failure of slopes. Definition of factor of safety, Stability of finite and infinite slopes- Method of slices, Friction Circle method, Taylor's stability number-numerical problems.

Self-study component:	Infinite slopes, Fellineous method

UNIT – V	**Bearing Capacity**	**8 Hours**

Bearing Capacity: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure, Types of shear failure, Terzaghi's and Brinch Hansen's bearing capacity equations-assumptions and limitations only, Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity, Standard penetration test, cone penetration test.

Self-study component:	Plate load test.

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Level Indicator
CO1	**Apply** the knowledge of Science and Geology in field to estimate Engineering properties of soil. **(PO1, PSO1)**	Applying	L3
CO2	**Evaluate** stresses in soils for settlement and stability analysis and **Evaluate** quantity of seepage**. (PO2, PSO2)**	Evaluating	L5
CO3	**Analyze** earth pressure and stability of slopes for design of earth retaining structures**. (PO2, PO3, PSO2)**	Analyzing	L4
CO4	**Evaluate** and **interpret** bearing capacity data for design of footings**. (PO2, PO4, PSO2)**	Evaluating	L5

Text Book:

1. Soil Mechanics and Foundation Engineering - Punmia B.C. (2005), 16th Edition Laxmi Publications Co., New Delhi.
2. Soil Mechanics and Foundation Engineering- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. Soil Engineering in Theory and Practice- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.

Reference Book:

1. Foundation Analysis and Design- Bowles J.E. (1996), 5th edition, McGraw Hill Pub. Co. New York.
2. Basic and Applied Soil Mechanics- Gopal Ranjan and Rao A.S.R.(2000), New Age International (P) Ltd., New Delhi.
3. Geotechnical Engineering- Venkatrahmaiah C. (2006), 3rd Edition New Age International (P) Ltd., New Delhi

Web and Video links:

1. Sub-surface Investigation: https://www.youtube.com/watch?v=IrmKLJVlhYM&list=PLwdnzlV3ogoXKIGhhuK3ybtGRmJJy0U_T
2. Dewatering Part-1: https://www.youtube.com/watch?v=a4x4Snn06X8
3. Dewatering Part-2 https://www.youtube.com/watch?v=PrPg7iTKub0
4. Stresses in Soil: https://www.youtube.com/watch?v=EzbX8ZBdiN0
5. Flow nets: https://www.youtube.com/watch?v=7juS8WP-L6o
6. Effective stress concept: https://www.youtube.com/watch?v=ySUr60U6jiM
7. Effective stress and Capillarity: https://www.youtube.com/watch?v=3cBVWhr3jRo
8. Concept of Lateral earth Pressure: https://www.youtube.com/watch?v=pH7Ly8KCR3E
9. Lateral earth Pressure and Retaining walls: https://www.youtube.com/watch?v=4VB8ejPvka4
10. Stability of earth slopes Part-1: https://www.youtube.com/watch?v=s87MHDA5evM
11. Stability of earth slopes Part-2: https://www.youtube.com/watch?v=s87MHDA5evM
12. Shallow Foundation and Bearing Capacity: https://www.youtube.com/watch?v=2ugkE5EvLZg

E-Books/Resources:

1. https://www.sciencedirect.com/topics/engineering/geotechnical-engineering
2. https://www.springer.com/journal/10706
3. https://www.tandfonline.com/journals/umgt20
4. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/stability-analysis
5. https://www.sciencedirect.com/topics/engineering/lateral-earth-pressure
6. https://www.taylorfrancis.com/chapters/edit/10.1201/9780429021596-108/effects-soil-variability-bearing-capacity-foundations-harabinov%C3%A1-panulinov%C3%A1-korman%C3%ADkov%C3%A1-kotrasov%C3%A1
7. https://www.icevirtuallibrary.com/page/ice-news/142-top-geotech-books
8. https://www.amazon.in/Introduction-Geotechnical-Engineering-2e/dp/9332507619
9. https://easyengineering.net/geotechnical-engineering-by-venkatramaiah-nw/

COURSE ARTICULATION MATRIX (APPLIED GEOTECHNICAL ENGINEERING –P21CV7023)															
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2												2		
CO2		2												2	
CO3		2	2											2	
CO4		2		2										2	
3-HIGH, 2-MEDIUM, 1-LOW															

ENVIRONMENTAL IMPACT ASSESSMENT [As per Choice Based Credit System (CBCS) & OBE Scheme] SEMESTER – VII			
Course Code:	**P21CV7024**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3:0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- The student will understand the procedure of conducting EIA.
- The student will be able to analyze different methods of EIA
- The student will be able to conduct EIA for water, air and noise environment.
- The students will enumerate the method of conducting EIA for water resource project, Highway project, Iron mining project.

UNIT – I	**Introduction to Environmental Impact Assessment**	**8 Hours**

Introduction: Definition of EIA, Need for EIA, EIS, FONSI, Utility of EIA, Scope of EIA, Step by step procedure of conducting EIA, REIA, CEIA, Limitations of EIA, Frame work of EIA, Functions of EIA, Environmental monitoring programmes

Self-study component:	Categorization of projects, EIA Guidelines for developmental projects.

UNIT – II	**Methodology of EIA**	**8 Hours**

Developmental projects - Description of affected environment with factors and indices, Methodologies of EIA – Adhoc method, Checklist method, Matrices method, Network method and Overlay method, cost benefit analysis.

Self-study component:	Description of baseline environment.

UNIT – III	**Environmental Attributes**	**8 Hours**

Assessment and prediction of impacts on attributes- Air environment, Water environment, Noise environment, Polices and regulatory framework, objectives and stages of environmental audit, audit protocol, preparation of audit report.

Self-study component:	Environmental legislation, EIA amendments.

UNIT – IV	**Public Involvement in EIA**	**8 Hours**

Assessment and prediction of impacts on attributes - Soil and ground water and Socio economic environment, solid waste management, waste disposal.
Objectives of public *Involvement*, and public *Involvement* techniques. Public *Involvement* in environmental decision making, Practical consideration in preparing in EIA and EIS.

Self-study component:	Procedure for getting environmental clearance.

UNIT – V	**Environmental Impact Case Studies**	**8 Hours**

EIA for water resource project, Highway project, Iron ore and Coal mining project use. Ploughing into fields, feeding to hogs and reuse of material in other industry.

Self-study component:	Evaluation and Interpretations of audit data

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Level Indicator
CO1	**Understand** the methodology of conducting EIA. **(PO1, PSO1)**	Understanding	L2
CO2	**Analyze** and select a suitable methodology of EIA for different projects. **(PO2, PO3, PO4, PSO1)**	Analyzing	L4
CO3	**Understand** the procedure for conducting EIA for different attributes and importance of public participation in EIA. **(PO1, PO3,PSO1)**	Analyzing	L4
CO4	**Analyze** and **understand** different case studies pertaining to EIA. **(PO2, PSO2)**	Analyzing	L3

Text Book:

1. Environmental Impact Analysis, Urban & Stacey, Jain R.K.
2. Environmental Impact Assessment, Mc Graw Hill Inc, L.W. Canter (1996)
3. Environmental Impact Assessment and Management, Daya Publishing house, Hosetti B.B., Kumar A (2014).

Reference Book:

1. Guidelines for EIA of Developmental Projects, MoEF, GOI
2. Environmental Quality management, South Asian Publishers Pvt. Ltd., Bindu N. Lohan
3. Contemporary published journals and documents – from Department of environment Government of India, ministry of forest and mining

Web and Video links:

1. Environmental Impact Assessment: https://www.youtube.com/watch?v=9-MEVIXr3Ko&list=PLLy_2iUCG87CkrNdXME16BCptwGx1fl67
2. EIA – Law, Policy and Institutional arrangements for EIA system: https://www.youtube.com/watch?v=7EdIFK15M48&list=PLLy_2iUCG87CkrNdXME16BCptwGx1fl67&index=14
3. EIA Process - Starting and Initial Stage:
4. https://www.youtube.com/watch?v=LEWdIbgM_wo&list=PLLy_2iUCG87CkrNdXME16BCptwGx1fl67&index=27
5. EIA Case Study: https://www.youtube.com/watch?v=vvcQGjKkGBI&list=PLLy_2iUCG87CkrNdXME16BCptwGx1fl67&index=60
6. EIA in INDIA: https://www.youtube.com/watch?v=7RXBhYPqoNM&list=PLLy_2iUCG87CkrNdXME16BCptwGx1fl67&index=11

E-Books/Resources:

1. download.nos.org/333courseE/24pdf
2. www.fao.org/3/a-i2802e.pdf
3. www-wds.worldbank.org
4. www.euroasiapub.org

COURSE ARTICULATION MATRIX (ENVIRONMENTAL IMPACT ASSESSMENT - P21CV7024)															
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2												2		
CO2	2												2		
CO3		2		1										2	
CO4		2												2	
3-HIGH, 2-MEDIUM, 1-LOW															

ADVANCED DESIGN OF STRUCTURES [As per Choice Based Credit System (CBCS) & OBE Scheme] SEMESTER – VII			
Course Code:	**P21CV7031**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3:0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Give a procedural knowledge to design a system, component or process as per needs and specifications of RC Structures like Continuous Beams, Combined Footing, Portal Frames and Steel Structures like Roof Truss, Plate Girder and Gantry Girder.
- Imbibe the culture of professional and ethical responsibilities by following codal provisions in the analysis, design of RC and Steel Structures.

PART-A: RC STRUCTURES		
UNIT – I	**Design of Combined Footings**	**7 Hours**
Introduction, types of combined footing, Proportioning of combined footings, design of rectangular and trapezoidal combined footing of slab and beam type.		
Self-study component:	Slab type combined footing	
UNIT – II	**Redistribution of Moments**	**6 Hours**
Concept of Redistribution of Moments and codal provisions. Analysis and Design of Reinforced Concrete Continuous Beams with moment redistribution.		
Self-study component:	Portal frames with moment redistribution	
UNIT – III	**Design of Portal Frames**	**7 Hours**
Introduction, load path in a building with portal frames, idealizations, analysis and design of portal frames with fixed base including design of all elements.		
Self-study component:	Portal frames with hinged base	
PART-B: STEEL STRUCTURES		
UNIT – IV	**Design of Roof Truss**	**7 Hours**
Introduction, types of roof trusses, Design of roof truss for different cases of loading(forces in members to be given).		
Self-study component:	Load calculations and analysis of trusses.	
UNIT – V	**Design of Gantry Girder**	**7 Hours**
Introduction, loads on gantry girder, design of gantry girders with all necessary checks.		
Self-study component:	Design of corbels for gantry girders	

UNIT – VI	Design of Plate Girder	6 Hours
Introduction, Design of bolted and welded plate girder with intermediate stiffener, bearing stiffener and all necessary checks.		
Self-study component:	Theory on tension field & simple post critical methods	

Question Paper Pattern:

- Two questions shall be set from each part (one from Part-A and one from Part-B). There can be maximum of three subdivisions in each question, if necessary.
- One full question should be answered from each part.
- Each question carries 50 marks.
- Code books – IS: 456, IS: 800, SP-16, SP (6) – Steel Tables, shall be referred for designing. The same will be provided during examination.

Course Outcomes: On completion of this course, students are able to:

COs	**Course Outcomes** with ***Action verbs*** for the Course topics	**Bloom's Taxonomy Level**	**Level Indicator**
CO1	***Apply*** the basic knowledge in ***design*** of RC elements to design advanced RC structures comprising of multiple RC elements. **(PO1, PO2, PO3, PO12, PSO1, PSO2, PSO3)**	Applying	L3
CO2	***Make use of*** the codal provisions to ***assess*** and ensure structural safety, stability and serviceability of RC structures. **(PO1, PO2, PO3, PO4, PO6, PO8, PO12, PSO1, PSO2, PSO3)**	Applying and Evaluating	L3 & L5
CO3	***Apply*** the basic knowledge in ***design*** of structural steel elements to design advanced steel structures comprising of multiple structural steel elements. **(PO1, PO2, PO3, PO12, PSO1, PSO2, PSO3)**	Applying	L3
CO4	***Make use of*** the codal provisions to ***assess*** and ensure structural safety, stability and serviceability of steel structures. **(PO1, PO2, PO3, PO4, PO6, PO8, PO12, PSO1, PSO2, PSO3)**	Applying and Evaluating	L3 & L5

Text Book:

1. N Krishna Raju, "Structural Design and Drawing of Reinforced Concrete and Steel", University Press.
2. N. Subramanian, "Design of Steel Structures", Oxford, IBH.
3. Duggal.S.K., "Design of Steel Structures", Tata McGraw-Hill Education, 2000.

Reference Book:

1. Dr. Ramchandra &Virendra Gehlot, "Design of Steel Structures", Scientific Publishers.
2. P. C. Verghese, "Limit State Design of Reinforced Concrete", PHI Publications, New Delhi.
3. Relevant Indian Standard Code books on RCC and Steel structures.

Web and Video links:

1. Design of combined footing, Lecture 39, by Prof. Kousik Deb, IIT Kharagpur: https://archive.nptel.ac.in/courses/105/105/105105207/
2. Analysis of portal frames, Lecture 18, by Prof. Shanka Pratim Bhattacharya, IIT Kharagpur: https://archive.nptel.ac.in/courses/124/105/124105015/
3. Introduction and design of gantry girder, Lecture 56,57 & 58, by Prof. Damodar Maity, IIT Kharagpur: https://archive.nptel.ac.in/courses/105/105/105105162/
4. Introduction and design of plate girder, Lecture 36, 37 & 38 by Prof. Damodar Maity, IIT Guwahati: http://engineeringvideolectures.com/video/3872

E-Books/Resources:

1. Basic Theory of Structures by S J C Browne https://www.elsevier.com/books/basic-theory-of- structures/browne/978-0-08-011654-9
2. Design of Steel structures by Elias G.Abu Saba, https://link.springer.com/book/10.1007/978-1-4615-2079-5.

COURSE ARTICULATION MATRIX
(ADVANCED DESIGN OF STRUCTURES - P21CV7031)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2									2	2	2	1
CO2	2	2	2	1		1		1				2	2	2	1
CO3	2	2	2									2	2	2	1
CO4	2	2	2	1		1		1				2	2	2	1
3-HIGH, 2-MEDIUM, 1-LOW															

URBAN TRANSPORT PLANNING

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – VII

Course Code:	**P21CV7032**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3: 0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- To cover concepts of urban transportation planning, various modes, transit systems and their suitability and to provide knowledge of Land use planning and transportation interaction.

UNIT – I	**Scope Of Urban Transport Planning**	**8 Hours**

Scope Of The Urban Transport Planning, Interdependence Of The Land Use And Traffic, System Approach To Transport Planning, Stages In Transport Planning, Forecast Analysis Of Future Conditions And Plan Synthesis.

Self-study component:	Transportation Problems And Identification

UNIT – II	**Transportation Surveys**	**8 Hours**

Definition Of Study Area, Zoning, Basic Movement For Survey, Various Transportation Surveys: Home Interview, Commercial Vehicle, Taxi, Road Side-Interview, Post Card Questionnaires, Registration Number, Tag And Public Transport Survey, Inventory Of Transport Facilities, Inventory Of Land Use And Economic.

Self-study component:	Sampling Techniques

UNIT – III	**Trip Generation**	**8 Hours**

Definition Of Trip Generation, Types Of Trip, Trip Purpose, Factors Affecting Trip Generation And Attraction, Multi Linear Regression Analysis: Assumptions And Validity In Trip Generation Studies, Category Analysis.

Problems On Regression Analysis.

Self-study component:	Aggregate And Disaggregate Analysis

UNIT – IV	**Trip distribution and Trip assignment**	**8 Hours**

Trip Distribution, Method Of Trip Distribution, Growth Factor Method-Uniform Factor Method, Average Factor Method, Fratar And Furness Methods, Synthetic Methods –. Gravity Model.

Purpose Of Trip Assignment - Principles – Assignment Techniques.

Self-study component:	Other Synthetic Model

UNIT – V	**Modal Split Analysis**	**8 Hours**

Model spilt definition, Factors affecting modal split analysis – characteristics of modal split, household characteristics, zonal characteristics and network characteristics, model split in urban transport planning process.

Public transport in cities and intermediate public transport in Indian cities, Intermodal transportation, Difficulties in transport planning, Computer application in transportation planning.

Self-study component:	Coordination Of Different Modes Of Transport

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Level Indicator
CO1	**Understand and apply** basic concepts and methods of urban transportation planning	Understanding	L2
CO2	**Build** and conduct surveys to provide the data required for transportation planning.	Applying	L3
CO3	**Understand** the process of developing trip generation and trip distribution models,	Understanding	L2
CO4	**Understand** the Trip assignment techniques; mode split models & public transport.	Understanding	L2

Text Book(s):

1. Kadiyali, L R, "Traffic Engineering and Transport Planning, Khanna Publishers
2. C. Jotin Khisty & B. Kent Lall, "Transportation Engineering-An Introduction, Prentice Hall of India Private Limited, Third Edition, New Delhi, 2006.
3. Subash C Saxena, "A Coures in Traffic Planning and Desing", Dhanapat Rai & Sons, Delhi, 1989.

Reference Book(s):

1. Hutchinson, B.G, 'Introduction to Urban System Planning', McGraw Hill.
2. Khisty C.J., 'Transportation Engineering – An Introduction' Prentice Hall.
3. Papacostas, 'Fundamentals of Transportation Planning', Tata McGraw Hill.
4. Documentation of Smart city

Web and Video link(s):

1. ScopeofUrbanTransportPlanning:https://www.youtube.com/watch?v=YAEyLOCU8I&list=PLA5B61833B976038C
2. TransportationSurveys: https://www.youtube.com/watch?v=qFzbStLr9Bo
3. TripGeneration: https://www.youtube.com/watch?v=wSp3BPaSMRo
4. TripdistributionandTripassignment: https://www.youtube.com/watch?v=ayNGToM15Dc
5. ModalSplitAnalysis: https://www.youtube.com/watch?v=pLEp7X_EjeE

E-Books/Resources:

- nptel.ac.in/courses/105107067/
- nptel.ac.in/downloads/105106058/

COURSE ARTICULATION MATRIX
(URBAN TRANSPORTPLANNING - P21CV7032)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2												2		
CO2	2	2											2		
CO3	2	2	2										2		
CO4	2	2											2		

3-HIGH, 2-MEDIUM, 1-LOW

ADVANCED FOUNDATION DESIGN

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – VII

Course Code:	**P21CV7033**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3:0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Gain knowledge of about advanced topics of foundation design and analyses.
- Design shallow foundation, pile and well foundation.
- Understand the requirement of foundation on expansive soil.
- Know about machine foundation.
- Learn about cause and effect of dynamic loads on foundation.

UNIT – I	**Design of Shallow Foundation**	**8 Hours**

Shallow Foundations: Presumptive bearing capacity according to BIS, Factors affecting bearing capacity, Factors influencing selection of depth of foundation, Types of shallow foundations and Settlement of Shallow Foundations: Immediate, consolidation & differential settlements.

Design of Shallow Foundation: Principles, Proportioning of footings for equal settlement, Proportioning of strip footings, spread footings and combined footings(Rectangular and Trapezoidal)

Self-study component:	Proportioning of Strap footing and Common types of mat foundations

UNIT – II	**Deep Foundation**	**8 Hours**

Pile Foundations: Introduction, Necessity of pile foundations, Classification, Load bearing capacity of single pile by Static formula, Dynamic formula, Pile load test, negative skin friction & under reamed piles. Pile Groups: Introduction, group action of piles in sand and clay, group efficiency of piles-Numericals.

Self-study component:	Laterally loaded piles and settlement of under reamed piles.

UNIT – III	**Caisson Foundation**	**8 Hours**

Well Foundations: Introduction, Different shapes and characteristics of wells. Components of well foundation. Forces acting on well foundation. Sinking of wells, Causes and remedies of tilts and shifts. Caissons-types: Open, Pneumatic and Floating caissons and its construction.

Self-study component:	Foundations for Marine structures, Advantages and Disadvantages of well foundation when compared to pile foundation.

UNIT – IV	**Foundation on Expansive Soil**	**8 Hours**

Expansive Soils: Introduction to expansive soil, Clay mineralogy and mechanism of swelling , Identification of expansive soils, Parameters of expansive soil:Swelling potential, swelling pressure, free swell, Free swell index, Classification of expansive soil – Tests for swell pressure (IS code method), CNS layer, Foundation treatment for structures in expansive soil.

Self-study component:	Effect of swelling on buildings, Advantages and disadvantages of drilled piers.

UNIT – V	Machine Foundations	8 Hours

Machine Foundations: Introduction, Types of Machine foundations, Basic definitions, Degree of freedom of a block foundation, General criteria for design of machine foundation, Free and Forced vibrations (No derivation) Vibration analysis of a machine foundation, Determination of natural frequency.

Self-study component:	Vibration isolation and control methods.

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Level Indicator
CO1	**Apply** the knowledge of Geology and Geo-technics to differentiate shallow & deep foundation**.(PO1,PSO1)**	Applying	L3
CO2	**Analyze** and **identify** various shallow and deep foundations for civil engineering structures**.(PO2,PSO2)**	Analyzing	L4
CO3	**Evaluate** and **design** shallow and deep foundation for civil engineering structures**.(PO2, PO3, PSO2)**	Evaluating	L5
CO4	**Evaluate** and **interpret** data to select suitable foundation for expansive soil from safety consideration**.(PO2, PO4, PSO2)**	Evaluating	L5

Text Book:

1. Soil Mechanics & Foundation Engineering, V.N.S. Murthy -Pub: Sai Tech.
2. Soil Mechanics Foundations, Dr. B.C. Punmia -Pub :Laxmipublications, Pvt. Ltd.
3. Soil Mechanics and foundation Engineering, K.R. Arrora&A.K.Jain for standard publishers &Distributors.
4. ASR Rao

Reference Book:

1. Pile Foundation, Chellies, McGraw Hill Book Co., Inc., New York, 1951
2. Geotechnical Engineering, P. Purushotham Raj, Pearson Publishers.

Web and Video links:

1. Civil-Advanced Foundation Engineering(Playlist):https://youtube.com/playlist?list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT
2. Shallow Foundation: Bearing Capacity-I:https://www.youtube.com/watch?v=YEltCJUZ0hk&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=6
3. Shallow Foundation: Bearing Capacity-II:https://www.youtube.com/watch?v=Hk38oSQcMuA&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=7
4. Shallow Foundation: Bearing Capacity-III:https://www.youtube.com/watch?v=TOisjkLWcEA&list=PLbMVogVj5nJQtuLxDm2M3

KdUTuB4ZOdXT&index=8

5. Shallow Foundation: Bearing Capacity-IV:https://www.youtube.com/watch?v=YNbGzebCeew&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=9
6. Shallow Foundation: Bearing Capacity-V:https://www.youtube.com/watch?v=y35U2Ym3uVw&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=10
7. Shallow Foundation: Settlement Calculation-I:https://www.youtube.com/watch?v=58Tz6L9-bo8&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=11
8. Shallow Foundation: Settlement Calculation-II:https://www.youtube.com/watch?v=ZN-Sfc2d1n0&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=12
9. Shallow Foundation: Settlement Calculation-III: https://www.youtube.com/watch?v=ele1uDp66J4&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=13
10. Design of Shallow Foundation:https://www.youtube.com/watch?v=RKSUaVR9CS0&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=14
11. Deep Foundation-Introduction:https://www.youtube.com/watch?v=SZefeLiaiIE&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=16
12. Pile load carrying capacity-I:https://www.youtube.com/watch?v=4U8NuA10Gzs&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=17
13. Pile load carrying capacity-II:https://www.youtube.com/watch?v=mSJo-qABJoE&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=18
14. Pile load carrying capacity-III and settlement calculations:https://www.youtube.com/watch?v=R1oFH54TaiM&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=19
15. Well Foundations:https://www.youtube.com/watch?v=gZwx7YRmLSc&list=PLbMVogVj5nJQtuLxDm2M3KdUTuB4ZOdXT&index=22
16. Foundation on Expansive soil:https://www.youtube.com/watch?v=lWoNPYoDB9w&list=PLwdnzlV3ogoWW8Zck0YwCT9l4FrdX7dM8&insex=27
17. Types of Machine Foundations, Methods of Analysis:https://www.youtube.com/watch?v=YAuq6-bAu2k
18. Degree of freedom and Types of vibrations:https://www.youtube.com/watch?v=WaS3SmYutuo&list=PLbMVogVj5nJTG8-vXdmotD90Yer7Vk-Mi&index=2
19. Types of vibration and free vibration:https://www.youtube.com/watch?v=LYmCGM0_PX0&list=PLbMVogVj5nJTG8-vXdmotD90Yer7Vk-Mi&index=3
20. Damped free vibrations:https://www.youtube.com/watch?v=RG3VwMO-

Smg&list=PLbMVogVj5nJTG8-vXdmotD90Yer7Vk-Mi&index=5

E-Books/Resources:

1. https://www.sciencedirect.com/topics/engineering/foundation-engineering
2. https://www.elsevier.com/books/methods-of-foundation-engineering/bazant/978-0-444-99789-0
3. https://www.springer.com/journal/11204
4. https://www.sciencedirect.com/science/article/pii/S1877705816340966
5. https://www.sciencedirect.com/journal/soils-and-foundations
6. https://www.sciencedirect.com/science/article/pii/S1674775518301513
7. https://www.sciencedirect.com/science/article/pii/S0038080620300160
8. https://www.taylorfrancis.com/chapters/mono/10.1201/9781003080039-10/general-principles-machine-foundation-design-swami-saran
9. https://www.tandfonline.com/doi/abs/10.1080/14488388.2021.1923431
10. https://www.amazon.in/Geotechnical-Foundation-Engineering-5-PB/dp/8183600700
11. https://www.pdfdrive.com/geotechnical-books.html
12. https://www.icevirtuallibrary.com/page/ice-news/142-top-geotech-books

COURSE ARTICULATION MATRIX
(ADVANCED FOUNDATION DESIGN- P21CV7033)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2												2		
CO2		2												2	
CO3		2	2											2	
CO4		2		2										2	

3-HIGH, 2-MEDIUM, 1-LOW

OPEN CHANNEL HYDRAULICS

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – VII

Course Code:	**P21CV7034**	**Credits:**	**03**
Teaching Hours/Week (L:T:P)	**3:0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Understand the channel classification, conservation equations for mass, momentum and kinetic energy in open channel flow.
- Explain the various types of flows in open channels, concepts of uniform flow and non-uniform flow and its computations.
- Determine the water surface profiles during gradually varied flow conditions.
- Design the ogee spillway and understating the application of hydraulic jump as energy dissipater and in various stilling basins.

UNIT – I	**Introduction and Uniform Flow**	**08 Hours**

Introduction: Introduction, classification of open channels, classification of flow, pressure and velocity distribution in open channel flow, energy equation, momentum equation, kinetic energy and momentum factors.

Uniform flow: Concepts, uniform flow equations, conveyance of channel section, section factor for uniform flow, Normal slope and critical slope, hydraulic exponent for uniform flow, design of channels for uniform flow.

Self-study component:	Uniform flow computations – Trapezoidal channel, circular channel.

UNIT – II	**Critical Flow and Gradually Varied Flow**	**08 Hours**

Critical flow: Energy Depth Relationships: Specific energy, Critical depth, Critical velocity, Section Factor for critical flow, Hydraulic exponent for critical flow, Numericals.

Gradually varied flow: Concepts, GVF equation, its different forms, Basic assumptions, Dynamic equation for wide rectangular channels, classification of channel bottom slopes, classification of water surface profiles in different sloped channels, Numericals.

Self-study component:	Transitions-Channel with hump, Transition with a change in width.

UNIT – III	**Gradually Varied Flow Computations**	**08 Hours**

Computation Methods: Different methods, direct integration method- Chow's solution, Bresse's Solution, direct step method, standard step method. Problems.

Self-study component:	Concept of Backwater curves in natural channels.

UNIT – IV	**Rapidly Varied Flow**	**08 Hours**

Rapidly varied flow: Concepts, hydraulic jump in rectangular channels, classification of hydraulic jump based on Froude's number and tail water depth, characteristics of hydraulic jump, Tail water curve and jump water curve. Numericals.

Self-study component:	Hydraulic Jumps in Sloped Channels.	
UNIT – V	**Stilling Basins And Spillways**	**08 Hours**

Stilling basins: Types and selection, Stilling basins and roller buckets. USBR and IS stilling basins.

Spillways: Definition, location of spillways, types of spillways. Ogee spillway (simple design problems).

Self-study component:	Concept of syphon spillway.

Course Outcomes: On completion of this course, students are able to:

COs	**Course Outcomes** with ***Action verbs*** for the Course topics	**Bloom's Taxonomy Level**	**Level Indicator**
CO1	**Apply** the concepts of water resources, hydraulics and hydrology in **understanding** flow occurring in open channels. **(PO1, PSO1)**	Applying	L3
CO2	**Evaluating** the various flow parameters of discharge, velocity and pressure by **developing** mathematical relationships in case of uniform and non-uniform flow conditions in solving complex problems of engineering field. **(PO2, PSO2)**	Evaluating	L5
CO3	**Analyze** and **identify** the various types of flow profiles, spillways, hydraulic jumps, stilling basins intended to serve the society. **(PO2, PSO2)**	Analyzing	L4
CO4	**Design** the ogee spillway and **determining** the water surface profiles for gradually varied flow. **(PO3, PSO2)**	Creating	L6

Text Book:

1. Santosh Kumar Garg – Irrigation Engineering and Hydraulic Structures, Khanna Publications, Vol. 2, New Delhi.
2. Dr. P. N. Modi – Irrigation Water Resources and Water Power Engineering, Standard Book House, 11th Edition, New Delhi.
3. K. Subramanya – Flow in Open Channels. McGraw Hill Education, 3rd Edition, New Delhi.
4. K. G. Ranga Raju – Flow through Open Channels. McGraw Hill Education, 2nd Edition, New Delhi.

Reference Book:

1. Ven Te Chow – Open Channel Hydraulics, The Blackburn press, 2009 edition.
2. P.N. Modi and S.M. Seth- Hydraulics and Fluid Mechanics, including Hydraulic machines, Standard Book House, 22nd Edition, New Delhi.
3. Terry W Sturm - Open Channel Hydraulics, McGraw Hill Education, International Edition 2001.
4. Satyanarayana Murthy, C, "Design of Minor Irrigation and Canal Structure", Wiley Eastern, 1990.

Web and Video links:

1. Velocity & Pressure distribution: https://www.youtube.com/watch?v=6ap5Tx1HkqY&list=PL485F1F6C7083FBE1&index=4
2. Computation of uniform flow: https://www.youtube.com/watch?v=rcU4xecS8gc&list=PL485F1F6C7083FBE1&index=9
3. Rapidly varied flow: https://www.youtube.com/watch?v=ra5LTEwSumU&list=PL485F1F6C7083FBE1&index=23
4. Computation of GVF: https://www.youtube.com/watch?v=AEpW_KmoNO0&list=PL485F1F6C7083FBE1&index=21
5. Ogee Spillway: https://www.youtube.com/watch?v=uhSjNoFmYqo

E-Books/Resources:

- https://bawar.net/data0/books/5ae78e477a944/pdf/[K_Subramanya]_hydraulic(.pdf
- https://heidarpour.iut.ac.ir/sites/heidarpour.iut.ac.ir/files//u32/open-chaudhry.pdf
- https://venkatasai.files.wordpress.com/2016/03/open-channel-hydraulics-by-terry-w-sturm-www-civilenggforall-com.pdf

COURSE ARTICULATION MATRIX
(OPEN CHANNEL HYDRAULICS– P21CV7034)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		2												2	
CO3		2												2	
CO4			2											2	

3 – HIGH, 2 – MEDIUM, 1 - LOW

QUANTITY SURVEYING AND CONTRACT MANAGEMENT
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – VII

Course Code:	**P21CV704**	**Credits:**	**04**
Teaching Hours/Week (L:T:P):	**3:0:2**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**50**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Understand the various drawings and to learn the calculation of quantities of materials.
- Learn the definition and objective of specifications.
- Learn to do the rate analysis for various building items.
- Compute the earthwork quantity for road estimate.
- Understand the concepts of contracts, tender and valuation.

UNIT – I	**Estimation of Residential Buildings**	**14 Hours**

Estimation: Preparation of detailed estimate and abstract cost for Buildings (flat roof only), Methods– center line method, long wall-short wall or cross wall method.

Self-study component:	Sloped RCC roofs with all Building components.
Practical Topics:	Centerline marking for single room, two room and structure building.

UNIT – II	**Estimation of Manhole, Septic Tank and Earthwork Calculation for Roads**	**14 Hours**

Estimation: Preparation of detailed estimate and abstract cost for manhole, septic tank with soak pit, RCC slab and stair case.

Quantity of Earthwork for Roads: Methods– Mid section method, Mean sectional area method, Trapezoidal formula & Prismoidal formula.

Self-study component:	Estimate of metalled road and premix Carpeting.
Practical Topics:	1. Study of reinforcement details and calculation of steel quantity. 2. Quantity of earthwork for roads (MS Excel): Methods– Mid section method, Mean sectional area method, trapezoidal formula & prismoidal formula.

UNIT – III	**Specifications and Rate Analysis**	**12 Hours**

Specifications: Definition, objective, Types- general and detailed specifications, Items- Earth work excavation in foundation, PCC in foundation, Size stone masonary, pointing, Brick works- I class and II class, RCC works- Roof slab, lintel, sunshade ,plastering , C.C. flooring,.

Rate analysis: Definition and purpose. Working out quantities and rates for the following works – Earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works – roof, columns, beam.

Self-study component:	Arriving at specification from product literature technical data sheet (TDS).
Practical Topics:	Collection of detailed specification of tender documents. Study of Schedule of Rates. Study of detailed project report(DPR).

UNIT – IV	Contract, Tender and Administrative approval	10 Hours

Contracts: Types of contract, contract agreement, legal aspects, right of contractor, penal provisions on breach of contract, acceptance of contract documents and issue of work orders. Definition of the terms – Tender (tender forms, documents and types), Earnest Money Deposit, Security Deposit, refund of deposit. Duties and liabilities – contractor and owner, Administrative approval – Technical sanction, Completion certificate. Measurement books –procedure for recording and checking measurements.

Self-study component:	Preparation of bills, Quality control, Nominal mustor roll.
Practical Topics:	1) E- Tender processing and comparative statements of tender.

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Level Indicator
CO1	***Apply*** the knowledge of engineering fundamentals for quantifying and cost estimate of buildings **(PO1, PO2, PSO1, PSO2)**	Applying	L3
CO2	***Apply*** the knowledge of engineering fundamentals for quantifying and cost estimate of man holes septic tanks and road works. **(PO1, PO2, PSO1, PSO2)**	Applying	L3
CO3	***Determine*** the rate analysis for different items of buildings as per applicable specifications. **(PO1, PO2, PSO2)**	Evaluating	L5
CO4	***Summarize*** the concept of contract, tender and administrative approval. **(PO1, PO4, PSO2)**	Understanding	L2
CO5	***Estimate*** the quantities of various building items and road work by using MS-Excel. **(PO1, PO2, PO5, PSO2, PSO3)**	Creating	L6

Text Book:

1.Estimating and Costing – B. N. Dutta, UBS Publishers Distributors Ltd, India.
2.Quantity Surveying- P.L. Basin S. Chand and Company, New Delhi.
3. Estimating & Specification - S.C. Rangwala, Charotar Publishing House, Anand.

Reference Book:

1. Text book of Estimating & Costing- G.S. Birde, DhanpathRai and sons: New Delhi.
2. A text book on Estimating, Costing and Accounts- D.D. Kohli and R.C. Kohli S. Chand: New Delhi.
3. Estimation and costing – H S Vishwanath, Sapna publications.
4. P.W.D Schedule of Rates and N.B.C.

Web and Video link(s):

1. Building cost estimation: https://onlinecourses.swayam2.ac.in/nou20_cs11/preview
2. Quantity surveying building estimation with Cad and Excel: https://www.udemy.com/course/quantity-surveyingbuilding-estimation/
3. Contract Management: https://onlinecourses.nptel.ac.in/noc22_lw06/preview

E-Books/Resources:

1. https://kanchiuniv.ac.in/coursematerials/estimation,costingandvaluation.pdf

COURSE ARTICULATION MATRIX
(QUANTITY SURVEYING AND CONTRACT MANAGEMENT- P21CV704)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2											1	2	
CO2	2	2											1	2	
CO3	2	2												2	
CO4	1			2										2	
CO5	2	2			3									2	1

3-HIGH, 2-MEDIUM, 1-LOW

Research Methodology and IPR [As per Choice Based Credit System (CBCS) & OBE Scheme] SEMESTER – VII			
Course Code:	**P21RMI705**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3:0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

CO1. Gain comprehensive understanding of research methodology & IPR importance

CO2. Create a framework for literature review and data sample collection

CO3. Interpret and write research reports

CO4. Understand the life cycle of IPR and its related legal aspects

UNIT – I	**8 Hours**

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.

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

Self-study component:	Case study to define research problem in the area of your interest.

UNIT – II	**8 Hours**

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

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs,.

Self-study component:	Know about Important Experimental Designs

UNIT – III	**8 Hours**

Design of Sampling: Introduction, Steps in Sample Design, Criteria of Selecting a Sampling Procedure, Characteristics of Good Sample Design.

Measurement Technique: Introduction, Measurement Scales, Sources of Error in Measurement, Technique of Developing Measurement Tools.

Data Collection: Collection of Primary Data, Difference between Questionnaires and Schedules, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Experiment and Survey.

Self-study component:	Case Study on Method of data collection

UNIT – IV	**8 Hours**

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation,

Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Intellectual Property: Introduction, Intellectual Property Regime in India, Copyrights, Trademarks, Patents, Designs, Trade Secrets, Geographical Indications and their Salient Features, Berne Convention, Paris Convention, Trade Related Aspects of Intellectual Property Rights (TRIPS) Agreement, Issues Covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Paris Convention for the Protection of Industrial Property, Berne Convention for the Protection of Literary and Artistic Works.

Self-study component:	Patent Cooperation Treaty (PCT)

UNIT – V	**8 Hours**

Indian Patent Law: Introduction, Concept of Patent, Product/Process Patents and Terminology, Patents Act 1970, Amendments to the Patent Act 1970, Patent Rules, Patentable Subject Matter and Patentability Critria, Duration of Patents - Law and Policy Consideration, Elements of Patentability, Procedure for Filing Patent applications and Types of Applications.

Self-study component:	Ownership and Maintenance of Patents

Course Outcomes: On completion of this course, students are able to:

COs	**Course Outcomes** with ***Action verbs*** for the Course topics	**Bloom's Taxonomy Level**	**Level Indicator**
CO1	To know the meaning of Research Methodology and the technique of defining the Research Problem.	Understand	L2
CO2	Describe the framework of Literature Review, research design and report writing.	Understand	L2
CO3	Illustrate the Sampling Design and Data Collection and Procedure of Report Writing	Understand	L2
CO4	Understand the fundamentals of Intellectual Property, Patent and Drafting Procedure.	Understand	L2

Text Book(s):

1. C.R. Kothari and Gaurav Garg, "Research Methodology: Methods and Techniques", New Age International 4th Edition, 2018.
2. Ranjit Kumar, "Research Methodology a step by-step guide for beginners", SAGE Publications, 3rd Edition, 2011.
3. Study Material, "Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament (e-book)

Reference Book(s):

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

Project Work Phase – I [As per Choice Based Credit System (CBCS) & OBE Scheme] SEMESTER – VII			
Course Code:	**P21CV706**	**Credits:**	**04**
Teaching Hours/Week (L:T:P):	**0:0:0**	**CIE Marks:**	**100**
Total Number of Teaching Hours:	**-**	**SEE Marks:**	**-**

Project Work: The Project Work (Phase I + Phase II) carries 12 credits (4 credits+8 credits) and spreads over TWO semesters, i.e. during 7th and 8th semesters.

I. Project Phase – I and Project seminar Comprises of Literature Survey, Problem identification, Objectives and Methodology. CIE marks shall be based on the report covering Literature Survey, Problem identification, Objectives and Methodology and seminar presentation skill.

II. The Assessment marks (CIE) in the case of Project Work - Phase I, shall be based on the evaluation at the end of the 7th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department, one of them may be the internal guide. The work may be evaluated by the committee for award of Assessment marks (CIE) based on a Report [comprising of synopsis, Introduction, Literature survey, Objective and Methodology], presentation and viva voce.

III. The project work shall be carried out by candidate(s) independently/in a group (maximum of four) during the seventh and eighth semester under the guidance of one of the faculty members of the Department of study. If the project work is of inter-disciplinary nature, a co-guide shall be taken from the same or any other relevant Department. If a project work has to be carried out in any industry / factory / organization, outside the campus, the permission for the same and the name of co-guide at any of these organizations shall be intimated to the authorities at the beginning of seventh semester by the Head of the Department.

Self-Study Course [As per Choice Based Credit System (CBCS) & OBE Scheme] SEMESTER – VIII			
Course Code:	**P21CV801**	**Credits:**	**02**
Total Number of Teaching Hours:	**-**	**CIE Marks:**	**100**
		SEE Marks:	**-**

The student has to choose and study the course related to the program discipline with her / his own efforts under the guidance of Course Instructor / Project guide, using study materials available in Open Sources i.e., Massive Open Online Courses (MOOCs) – NPTEL Courses. The intention of the course is to encourage the habit of self-learning. In this regard, the department has to release the pool of courses from the list of available 8 weeks NPTEL online courses according to NPTEL calendar of events. The student has to register for the course from the available pool during VII / VIII Semester and the same will be reflected in the Grade Card of VIII Semester. The 100 marks CIE assessment is based on the final NPTEL score (i.e. Online assignments: 25% + Proctored exam: 75%). The NPTEL score will be mapped directly to the CIE marks as per the calculation below only if he /she has completed the NPTEL course (i.e. Certification).

CIE = (NPTEL Score X 1.5) = [Maximum CIE should be 100 Marks]

[Ex. – 1: If NPTEL Score is 52 then the CIE will be = 52 X 1.5 = 78

Ex. – 2: If NPTEL Score is 80 then the CIE will be = 80 X 1.5 = 100 (Subjected to a Maximum CIE Marks of 100)]

If the student fails to complete the NPTEL course at the end of the VIII Semester, then the department has to constitute a committee consisting of the Head of the department, two senior faculty members of the department, one of them may be the internal guide. The evaluation is based on a Report, Presentation, and Viva-Voce of the NPTEL chosen topic and the assessment is a relative evaluation in context to the student's completed NPTEL course Certification (i.e. the CIE Score should be less than the score of the student who cleared the NPTEL Course).

Note: The student who fails to enroll and appear for the proctored exam in NPTEL is considered to have failed.

Research / Industry Internship - III [As per Choice Based Credit System (CBCS) & OBE Scheme] **SEMESTER – VIII**			
Course Code:	**P21INT802**	**Credits:**	**06**
Teaching Hours/Week (L:T:P):	**0:0:0**	**CIE Marks:**	**-**
Total Number of Teaching Hours:	**-**	**SEE Marks:**	**100**

Guidelines for Internship:

I. Internship is of minimum Fifteen weeks duration and to be completed between the vacation period of VI & VII semester and VII & VIII semester.

II. The internship can be carried out in any industry/ R & D Organization/ Research/ Institute/ Educational institute of repute/ Internshala (ACITE MoU Internship).

III. The Department/college shall nominate staff member/s to facilitate, guide and supervise students under internship.

IV. The Internal Guide has to visit place of internship at least once during the student's internship.

V. The students shall report the progress of the internship to the guide in regular intervals and seek his/her advice.

VI. After the completion of Internship, students shall submit a report with completion and attendance certificates to the Head of the Department with the approval of both internal and external guides.

VII. There will be 100 marks for Viva Voce conducted during Semester End Examination (SEE) of VIII Semester. For the conduction of Internship Semester End Examination following instructions are issued:

a. The Semester End Examination (SEE) for 100 marks shall be conducted similar to final semester project work / lab examination.

b. Internal & External Examiners shall be appointed by the BoE – Chairperson in consultation with HoD and approval of the same by the Principal & Controller of Examination.

c. External Examiner may be from the Industry. If the external examiner from the industry is not available, alternative arrangement shall be made by the BoE - Chairperson by appointing a faculty from out of the available faculty in the department, wherein the student is studying.

VIII. The students are permitted to carry out the internship anywhere in India or abroad. The Institution will not provide any kind of financial assistance to any student for carrying out the Internship.

IX. Failing to undergo Internship: Internship is one of the head for obtaining degree, therefore completion of internship is mandatory.

Project Work Phase – II [As per Choice Based Credit System (CBCS) & OBE Scheme] SEMESTER – VIII			
Course Code:	**P21CV803**	**Credits:**	**08**
Teaching Hours/Week (L:T:P):	**0:0:0**	**CIE Marks:**	**100**
Total Number of Teaching Hours:	**-**	**SEE Marks:**	**100**

Project Work: The Project Work (Phase I + Phase II) carries 12 credits (4 credits+8 credits) and spreads over TWO semesters, i.e. during 7th and 8th semesters.

I. Project Phase – I and Project seminar Comprises of Literature Survey, Problem identification, Objectives and Methodology. CIE marks shall be based on the report covering Literature Survey, Problem identification, Objectives and Methodology and seminar presentation skill.

II. The Assessment marks (CIE) in the case of Project Work - Phase I, shall be based on the evaluation at the end of the 7th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department, one of them may be the internal guide. The work may be evaluated by the committee for award of Assessment marks (CIE) based on a Report [comprising of synopsis, Introduction, Literature survey, Objective and Methodology], presentation and viva voce.

III. The project work shall be carried out by candidate(s) independently/in a group (maximum of four) during the seventh and eighth semester under the guidance of one of the faculty members of the Department of study. If the project work is of inter-disciplinary nature, a co-guide shall be taken from the same or any other relevant Department. If a project work has to be carried out in any industry / factory / organization, outside the campus, the permission for the same and the name of co-guide at any of these organizations shall be intimated to the authorities at the beginning of seventh semester by the Head of the Department.

IV. The weekly progress of the Project work shall be monitored and reviewed by the Project Guide assigned by DUGC. The method of evaluation, including intermediate assessment shall be evolved by the pertinent DUGC.

V. A candidate shall submit N+3 (No. of candidates+3) copies of the Report of the Project Work to Head, DUGC on or before the specified date. The report shall be in the format prescribed by the Institute. The candidate shall submit a report of the project work (dissertation) duly approved by the guide and co-guide. The project report shall be countersigned by the guide, co-guide (if any) and the Head of the Department

VI. The last date for the submission of Report shall be Two weeks before the closure of the semester in which the project work credits have been registered for and is expected to be completed or as announced by the COE. The date of submission of the dissertation may be extended up to a maximum of eight academic years, from the date of commencement of the first semester in which the candidate has taken admission to the course.

VII. The final evaluation (CIE & SEE) for Project Work - Phase II is done by a Project Work Evaluation Committee (PWEC) constituted by the pertinent DUGC. There shall be an open seminar followed by a viva – voce examination as part of the final evaluation. After the final evaluation, appropriate letter grade is awarded.

VIII. If in the opinion of the PWEC, the Project Report is acceptable with minor modifications for the minimum passing grade 'E' (Fair) in the case of project, the PWEC shall value and instruct the candidate suitably to incorporate the necessary modifications and to resubmit it to the Chairman, PWEC. After such resubmission, the Chairman, PWEC will certify that the necessary modification has been incorporated.

IX. The Assessment marks in case of Project Work - Phase II and seminar shall be based on the evaluation, as per the guidelines, at the end of the 8th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department (one of them may be the internal guide).

X. The Assessment marks sheet shall bear the signature of all those concerned, along with the date and seal of the Principal.