SJB Institute of Technology

(Affiliated to VTU, Accredited by NAAC with 'A' Grade, Approved by AICTE- New Delhi, Accredited by NBA)
No. 67, BGS Health & Education City, Dr.Vishnuvardhana Road, Kengeri, Bangalore-560060.

Department of Civil Engineering

Course Outcomes and CO-PO-PSO Articulation Matrix - Batch 2018-22

Semester-I/II

Subject: Elements of civil engineering and mechanics		Subject Code:18CV14
	Course Outcomes	
CO1	Outline the various fields in Civil Engineering and its importance on infrastructure.	
CO2	Analyse the force system applied to the structural members under static condition.	
CO3	Analyse effect of forces on system	
CO4	Evaluate the effect of center of gravity and moment of inertia for given structure	
CO5	Analyse the force system and dynamic condition	

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2														
CO2	3	3													
CO3	3	3													
CO4	3	3													
CO5	2	2													
Average	2.6	2.75													

Semester-III

Subject: Engineering Mathematics-III		Subject Code:18MAT31
	Course Outcomes	
CO1	Know the use of periodic signals and Fourier series to analyze circuits and systems communication.	
CO2	Explain the general linear system theory for continous - time signals and digital signal processing using the Fourier transform and z-transform.	
CO3	Employ appropriate numerical methods to solve algebraic and transcedental equations.	
CO4	Apply Green's theorem, Divergence theorem and Stokes theorem in various applications in the field of electro-magnetic and gravitational fields and fluid flow problems.	
CO5	Determine the extermals of functional and solve the simple problems for calculus of variations. Utilize the concepts of functional and their variations in the applications of communication systems, decision theory, synthesis and optimization of digital circuits.	

CO-PO-PSO Mapping

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

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

Subject: Strength of Materials												**Subject Code:** 18CV32		
Course Outcomes														
CO1	Explain the basic concepts of stress and strain, strength of different materials experiencing axial forces, tangential forces and moment.													
CO2	Evaluate the internal forces and resistance mechanism for one dimensional and two-dimensional structural elements.													
CO3	Analyse bending and shearing stresses induced due to representative loads on beams.													
CO4	Determine slope and deflections in beams by double integration method.													
CO5	Estimate the strength of torsion members, columns and struts.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	1									3	3		
CO2	3	3	2									2	3		
CO3	3	3	2									2	3		
CO4	3	3	2									1	3		
CO5	3	3	2									1	3		
Average	3	3	1.8									1.8	3		

Subject: Fluid Mechanics													**Subject Code:** 18CV33		
Course Outcomes															
CO1	Identify the properties of fluid as a continuum														
CO2	Solve Problems on hydrostatic, including practical applications														
CO3	Demonstrate apply the principles of continuity, moment and energy as apply to fluid														
CO4	Determine the flow measurements and various losses in flow through pipes														
CO5															
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	
CO1	2	2	1	1		1	1		1		1	2	1	2	
CO2	2	2	2	1		2	1		1		2	1	1	1	
CO3	2	2	1			2			2		2	1	1	1	
CO4	2	2	1		1	1	2		1		1	1	1	1	
CO5															
Average	2	2	1.25	0.5	0.25	1.5	1		1.25		1.5	1.25	1	1	

Subject: Building Materials and Construction													**Subject Code:** 18CV34		
Course Outcomes															
CO1	Develop knowledge of material science and behaviour of various building materials used in construction.														
CO2	Identify the construction materials required for the assigned work.														
CO3	Provide procedural knowledge of the simple testing methods of cement, lime and concrete etc.														
CO4	Adopt suitable repair and maintenance work to enhance durability of buildings.														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2												2		
CO2	2						1						2	1	
CO3	2												1		

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

CO4	2											1			
Average	2						1					1	1.66	1	

Subject: Basic Surveying												**Subject Code:** 18CV35		
Course Outcomes														
CO1	Outline the fundamental principles of surveying													
CO2	Utilize linear and angular measurement to solve basic surveying problems													
CO3	Make use of geodetic data to solve survey problems													
CO4	Analyze obtained spatial data and compute the areas and volumes													
CO-PO-PSO Mapping														
COs	**POs**											**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2										1	2	2
CO2	2	2											2	2
CO3	2	3		2									1	1
CO4	2	2					3	1					2	2
CO5														
Average	2	2.2		2			3	1				1	1.7	1.7

Subject: Engineering Geology												**Subject Code:** 18CV36		
Course Outcomes														
CO1	Apply geological knowledge in different civil engineering practice													
CO2	acquire knowledge on durability and competence of foundation rocks, and confidence enough to use the best building materials.													
CO3	competent enough for the safety, stability, economy and life of the structures that they construct.													
CO4	solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems.													
CO5	apply GIS, GPS and remote sensing as a latest tool in different civil engineering construction.													
CO-PO-PSO Mapping														
COs	**POs**											**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2				3	2					2		2
CO2	2	2				2	2					2		2
CO3	2	2				2	3					2		2
CO4	3	2				2	2					2		2
CO5	2	2				2	2					2		2
Average	2	2				2	2					2		2

Subject: Computer Aided Building Planning and Drawing		**Subject Code:** 18CVL37
Course Outcomes		
CO1	Prepare, read and interpret the drawings in a professional set up.	
CO2	Know the procedures of submission of drawings and Develop working and submission drawings for building.	
CO3	Plan and design are residential or public building as per the given requirements.	
CO-PO-PSO Mapping		

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1					1						1	1		
CO2	1					1		1				1	1		
CO3	1					1		1				1	1		
Average	1					1		1				1	1		

Subject: Building Materials Testing Laboratory		Subject Code: 18CVL38
Course Outcomes		
CO1	Apply the basic knowledge of Engineering and Mathematics to study the behavior of building materials under the action of tension, compression, bending, shear and torsion.	
CO2	Estimate the hardness and impact strength of various metals such as mild steel, aluminum, copper and brass.	
CO3	Evaluate the physical properties of aggregates and their impact on construction Industry.	

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2		1				2	3				2		
CO2	2	2		1				2	3				2		
CO3	2	2		1				2	3				2		
Average	2	2		1				2	3				2		

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

Semester-IV

Subject: Engineering Mathematics-IV	Subject Code:18MAT41
Course Outcomes	
CO1	Solve first and second ordinary differential equations arising in flow problems using single step and multistep numerical methods.
CO2	Solveproblems of quantum mechanics employing Bessel's function relating to cyclindrical polar coordinatesystems and Legrendre's polynomials relating to spherical polar coordinate systems
CO3	Understand the analyticity,potential fields,residues and poles of complex potentials in field theory and electromagnetic theory Describe conformal and bilinear transformation arising in aerofoil theory fluid flow visualization and image processing
CO4	Solve problems on probability distributions relating to digital signal processing, Determie joint probability distributions and stochastic matrix connected with multivariate correlation problems for feasible random events
CO5	Draw the validity of the hypothesis proposed for the given sampling distribution in accepting or rejecting the hypothesis, Definetransition probability matrix of a Markov chain and solve problems related to discrete parameter random process.

CO-PO-PSO Mapping

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

Subject: Analysis of Determinate Structures	Subject Code: 18CV42
Course Outcomes	
CO1	Describe the basic concepts of structural analysis and types of structures.
CO2	Construct Influence line diagram for various moving loads on determinate beams and trusses.
CO3	Determine the deflection of determinate beams by moment area and conjugate beams methods.
CO4	Apply energy principles to determine the deflection of determinate beams, bent frames and trusses.
CO5	Apply the concepts of Engineering Mechanics to determine the stress resultants of arches and suspension cables.

CO-PO-PSO Mapping

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3											2		
CO2	3	3											2		
CO3	3	3											2		
CO4	3	3											2		
CO5	3	3											2		
Average	3	3											2		

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru 560 060

Subject: Applied Hydraulics													**Subject Code:** 18CV43		
Course Outcomes															
CO1	Principles of dimensional analysis to design the hydraulic model, to known the concept of Buoyancy and floatation														
CO2	Design the OPC														
CO3	Understand the concept of impact of jet														
CO4	Design of centrifugal pumps														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	1					2							2	
CO2	2	1					2							2	
CO3	2	1					2							2	
CO4	1	1					2							2	
Average	1.5	1					2							2	

Subject: Concrete Technology													**Subject Code:** 18CV44		
Course Outcomes															
CO1	Understand material characteristics and their influence on microstructure of concrete.														
CO2	Distinguish concrete behavior based on its fresh and hardened properties.														
CO3	Design of different types of concrete mixes for required fresh and hardened properties using professional codes.														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2											2		
CO2	2	2											2		
CO3	2	2	2	2				2					2		
Average	2	2	2	2				2					2		

Subject: Advanced Surveying													**Subject Code:** 18CV45		
Course Outcomes															
CO1	Apply the knowledge of geometric principles to arrive at surveying problems														
CO2	Analyse the obtained geo-spatial data to appropriate engineering problems														
CO3	Design and implement the different types of curves for deviating type of alignments.														
CO4	Process and perform analysis to survey problems for Captured geodetic data with the use of electronic instruments														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2	2										2		
CO2	2	2	2									2	2		
CO3	2	2	2									2	2		
CO4	2	2	2	2				2				2	2		
Average	2	2	2	2				2				2	2		

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

Subject: Water Supply and Treatment Engineering												Subject Code: 18CV46		
Course Outcomes														
CO1	Estimate average and peak water demand for a community.													
CO2	Identify the sources of water supply and to apply proper sampling techniques for the analysis of water.													
CO3	Apply drinking water quality standards and to illustrate qualitative analysis of water.													
CO4	Design a comprehensive water treatment and distribution system to purify and distribute water to the required quality standards													
CO5	Design proper conveyance systems for raw and treated water.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2						3					1		2	
CO2	2		2				3					1		2	
CO3	1	1		1			3					1		2	
CO4	1						3					1		2	
Average	1.5	1	2	1			3					1		2	

Subject: Engineering Geology Laboratory												Subject Code: 18CVL47		
Course Outcomes														
CO1	Identify the minerals, rocks and utilize them effectively in civil engineering practices.													
CO2	Interpret and understand the geological conditions of the area for implementation of civil engineering projects.													
CO3	Interpret subsurface information such as thickness of soil, weathered zone, depth of hard rock and saturated zone by using geophysical methods.													
CO4	Acquire techniques in the interpretation of LANDSAT Imageries to find out the lineaments and other structural features for the given area.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2					2	2			2		1		2	
CO2	2					2	2			2		1		2	
CO3	2					2	2			2		1		2	
CO4	2					2	2			2		1		2	
Average	2					2	2			2		1		2	

Subject: Fluid Mechanics Laboratory												Subject Code: 18CVL48		
Course Outcomes														
CO1	Properties of fluids and use of various instruments for fluid flow measurements													
CO2	Working of hydraulic machines under various conditions of working and their characteristics													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2					1					1		1	
CO2	2	2					2					1		1	
Average	2	2					1.5					1		1	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru 560 060

Semester-V

Subject: Construction Management and Entrepreneurship	Subject Code: 18CV51
Course Outcomes	
CO1	Outline the construction management process
CO2	Assess various issues that are encountered by every professional in discharging profesional duties
CO3	Identifying the professional obligation effectively with global outlook

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1				1			1	1		1	1		2	
CO2	1	1												2	
CO3	1										2	1		2	
Average	1	1			1			1	1		1.5	1		2	

Subject: Analysis of Indeterminate Structures	Subject Code: 18CV52
Course Outcomes	
CO1	Determine the support moments of indeterminate beams and rigid frames using slope deflection method.
CO2	Determine the support moments of indeterminate beams and rigid frames with non-sway and sway using moment distribution method.
CO3	Construct bending moment and shear force diagrams for continuous beams and rigid frames by Kani's method.
CO4	Construct bending moment and shear force diagrams for continuous beams and rigid frames by system flexibility method.
CO5	Analyse continuous beams, rigid frames and plane trusses by system stiffness method.

CO-PO-PSO Mapping

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

Subject: Design of RC Structural Elements	Subject Code: 18CV53
Course Outcomes	
CO1	Apply the design philosophies and principles of the codal provisions.
CO2	Analyse and design of the beam elements for flexure ,shear and torsion.
CO3	Analyse and design of the slab and staircase using the knowledge of codal provisions.
CO4	Design of the column and footing using the design principles

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

CO1	2	1	1					3				1	2		
CO2	3	3	3					3				2	2		
CO3	3	2	3					3				2	2		
CO4	3	2	3					3				2	2		
Average	2.75	2	2.5					3				1.75	2		

Subject: Basic Geotechnical Engineering												**Subject Code:** 18CV54			
Course Outcomes															
CO1	Identify the type of soil based on physical properties														
CO2	Interpret the hydraulic conductivity of the soils.														
CO3	Compute the effective stresses of the soil strata														
CO4	Evaluate the engineering properties and failure behaviour of soil in terms of shear and compressibility														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2											2		
CO2	3	2			1								2		
CO3	3	2											2		
CO4	3	2			1								2		
Average	3	2			1								2		

Subject: Municipal Wastewater Engineering												**Subject Code: 18CV55**			
Course Outcomes															
CO1	Estimate the waste water and storm waterd flows and apply the concept of sewer appurtenances.														
CO2	Design the different unit operations and unit processes involved in waste water treatment process.														
CO3	Apply the concept and design of various physico-chemical and biological treatment.														
CO4	Apply the concept of various advance waste water and low-cost treatment process for rural areas.														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2						3					1		2	
CO2	2		2				3					1		2	
CO3	1	1		1			3					1		2	
CO4	1						3					1		2	
Average	1.5	1	2	1			3					1		2	

Subject: Highway Engineering		**Subject Code: 18CV56**
Course Outcomes		
CO1	Understand the importance & characteristics of road transport system, classification of roads and propose alignment based on planning principles & engineering surveys.	
CO2	Apply aspects of road geometrics and suitably design road geometric elements and drainage systems.	
CO3	Evaluate the engineering properties of the materials and provide suitable guidelines for pavement construction.	
CO4	Analyse the highway economics and impart the knowledge on highway financing concepts.	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3													2	
CO2	3		2					1						2	
CO3	3						1	1						2	
CO4	2										1			2	
Average	2.75		2				1	1			1			2	

Subject: Surveying Practice	**Subject Code:** 18CVL57
Course Outcomes	
CO1	Apply the basic principles of Engineering survey for linear and angular measurements
CO2	Make use of field procedures required for a professional surveyor
CO3	Choose appropriate techniques, skills and conventional surveying instruments necessary for Engineering practices

CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	1	1				2	2	2					1	
CO2	1	2	1				2	2	3					1	
CO3	2	2	1				2	3	1					1	
Average	1.3	1.7	1				2	2.3	2					1	

Subject: Concrete and Highway Materials Laboratory	**Subject Code:** 18CVL58
Course Outcomes	
CO1	Determine quality and suitability of cement in construction work
CO2	Design appropriate concrete mix and determine workability and strength of concrete
CO3	Test the road aggregates and bitumen for their suitability as road material
CO4	Evaluate the soil suitability as a pavement subgrade soil

CO-PO-PSO Mapping															
Cos	**Pos**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3					1	1	1						1	
CO2	3					1	1	1						1	
CO3	3		1			1	1	1						1	
CO4	3					1	1	1						1	
Average	3		1			1	1	1						1	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru 560 060

Semester-VI

Subject: Design of steel structural elements	Subject Code: 18CV61
Course Outcomes	
CO1	Explain the basics concepts of steel structures, steel code provisions and plastic behavior of steel.
CO2	Design of bolted and welded connections.
CO3	Design of compression members, built-up columns and columns splices
CO4	Analyze and design of steel members under flexure

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3					3				3	3		
CO2	3	3	3					3				3	3		
CO3	3	3	3					3				3	3		
CO4	3	3	3					3				3	3		
Average	3	3	3					3				3	3		

Subject: Applied Geotechnical Engineering	Subject Code: 18CV62
Course Outcomes	
CO1	Execute geotechnical site investigation program for different civil engineering projects
CO2	Estimate stresses in soils, load carrying capacity of shallow and deep foundation and resulting settlement beneath the loaded footings on sand and clayey soils
CO3	Evaluate the safety factors against failure of slopes and bearing failure of foundation
CO4	Predict the distribution of lateral pressure behind the retaining walls

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2		2									2		
CO2	3	2		2	1								2		
CO3	3	2	2	2									2		
CO4	3	2		2	1								2		
Average	3	2	2	2	1								2		

Subject: Hydrology and Irrigation Engineering	Subject Code: 18CV63
Course Outcomes	
CO1	Understand the importance of hydrology and its components.
CO2	Measure precipitation and analyze the data and analyze the losses in precipitation.
CO3	Estimate runoff and develop unit hydrographs.
CO4	quantity irrigation water requirement and frequency of irrigation for various crops.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2				2	2					2		2	
CO2	2	2				2	2					2		2	
CO3	2	2				2	2					2		2	
CO4	2	2				2	2					2		2	
Average	2	2				2	2					2		2	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

Subject: Matrix Methods of Structural Analysis												**Subject Code:** 18CV641		
Course Outcomes														
CO1	Evaluate the structural systems and apply the concepts of flexibility and stiffness matrices for simple problems.													
CO2	Identify, formulate and solve engineering problems with respect to flexibility matricies as applied to continuous beams, frames and trusses.													
CO3	Identify, formulate and solve engineering problems with respect to stiffness matricies as applied to continuous beams, frames and trusses.													
CO4	Identify, formulate and solve engineering problems with respect to direct stiffness method as applied to continuous beams, frames and trusses.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3											2		
CO2	3	3											2		
CO3	3	3											2		
CO4	3	3											2		
Average	3	3											2		

Subject: Railways, Harbour, Tunneling and Airports												**Subject Code:** 18CV645		
Course Outcomes														
CO1	Outline the importance of planning, construction aspects and maintenance of various components in Railways and Airport.													
CO2	Design and plan railway system, airport layout, facilities required for run-way, taxiway and impart knowledge on visual aids.													
CO3	Apply design features of features of tunnels, harbours including necessary navigational aids and summaries various methods of tunnels and environmental consideration.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3					1								2	
CO2	3	2				1		1						2	
CO3	3	2				1		1						1	
Average	3	2				1		1						1.6	

Subject: Solid Waste Management												**Subject Code:** 18CV642		
Course Outcomes														
CO1	Analyze existing SWM system & to identify their drawbacks													
CO2	Evaluate different elements of SWM systems													
CO3	Suggest suitable methods for SWM elements													
CO4	Design suitable processing system & evaluate disposal sites													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2						3					3		3	
CO2	2						3					3		3	
CO3	2						3					3		3	
CO4	3						3					3		3	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

Average	2.75						3					3		3	

Subject: Traffic Engineering												**Subject Code:** 18CV652			
Course Outcomes															
CO1	Understand and identify the fundamental components of traffic engineering														
CO2	Collection and analysis traffic survey data.														
CO3	Design and detailing of various types of intersections														
CO4	Evaluate traffic impacts on environment and traffic safety measures														
CO5	Recommend suitable traffic management and demand management measures														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3													1	
CO2	2	2												1	
CO3	3	2	2					1				1		1	
CO4	2					2	2					1		1	
CO5	2					1						1		1	
Average	2	2	2			1.5	2	1				1		1	

Subject: Occupational health and safety												**Subject Code:** 18CV653			
Course Outcomes															
CO1	Identify hazards in the workplace that pose danger to health and safety of others.														
CO2	Control unsafe, unhealthy hazards and propose to eliminate hazards														
CO3	Coherent analysis of a potential safety or health hazard citing the occupational health and safety regulation														
CO4	Discuss the role of health and safety in the workplace pertaining to responsibilities of supervisor, workers and managers														
CO5	Identify the decisions required to maintain protection of environment workplace aswell as personal safety.														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	2	2				2	2	2	2		2	2		
CO2	1	2	2				2	2	2	2		2	2		
CO3	1	2	2				2	2	2	2		2	1		
CO4	2	2	1				1	1	1	1		1	1		
CO5	2	2	1				1	1	1	1		1	1		
Average	1.4	2	2				2	2	2	2		2	1.4		

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

Subject: Software Application Lab												**Subject Code:** 18CVL66		
Course Outcomes														
CO1	Use of software skills in a professional setup to automate the work and thereby reduce cycle time for completion of work.													
CO-PO-PSO Mapping														
COs	**POs**											**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	2	2		3	1		2	2		3	2	2		
Average	1	2	2		3	1		2	2		3	2	2		

Subject: Environmental Engineering Lab												**Subject Code:**18CVL67		
Course Outcomes														
CO1	Acquire capability to conduct experiments and estimate the concentration of different parameters													
CO2	Compare the result with standards and discuss based on the purpose of analysis													
CO3	Determine type of treatment degree of treatment for water and wastewater.													
CO4	Identify the parameter to be analysed for student project work in environmental stream													
CO5														
CO-PO-PSO Mapping														
COs	**POs**											**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	2			2		2	2				3	
CO2	2	2				2	2	2	1	2				3	
CO3	2	2	2	2		2	2	2		1				3	
CO4	2	2	2	2	2	2	2	2	2			3		2	
Average	2.2	2	1.6	2	2	2	2	2	1.6	1.6		3		2.7	

Subject: Extensive Survey Project /Camp												**Subject Code:** 18CVL68		
Course Outcomes														
CO1	Apply Surveying knowledge and tools effectively for projects													
CO2	Understanding Task environment, Goals, responsibilities, Task focus, working in Teams towards common goals, Organizational performance expectations, technical and behavioral competencies.													
CO3	Application of individual effectiveness skills in team and organizational context, goal setting, time management, communication and presentation skills.													
CO4	Professional etiquettes at workplace, meeting and general													
CO5	Establishing trust-based relationships in teams & organizational environment													
CO6	Orientation towards conflicts in team and organizational environment, Understanding sources of conflicts, Conflict resolution styles and techniques													
CO-PO-PSO Mapping														
Cos	**Pos**											**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2				2	2	2					2	2	2	
CO2	2	2			2	2	2					2	2	2	
CO3	2				2	2	2					2	2	2	
CO4	2					2	2	2		2	2	1	2	2	
CO5	2					2	2	2				2	2	2	
CO6	**2**					**2**	**2**	**2**				**2**	2	**2**	
Average	2	2			2	2	2	2		2	2	1.8	2	2	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru 560 060

Semester-VII

Quantity Surveying and Contract Management	18CV71
Course Outcomes	
CO1	Estimate the quantities of different items of work for roads and buildings
CO2	Develops specification for civil Engineering works and prepare rate analysis
CO3	Interpret contract document of domestic and international construction works
CO4	Develop valuation reports of buildings

CO-PO-PSO Mapping

Cos	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2			1	1	1			2			1	
CO2	3		3			1		2			2	1		1	
CO3	2	2				1		2			2	1		1	
CO4	2	2	3			1		2			2	1		1	
Average	2.5	2	2.25			1	1	1.75			2	1		1	

Subject: DESIGN OF RCC AND STEEL STRUCTURES	Subject Code: 18CV72
Course Outcomes	
CO1	Apply basic knowledge of limit state method and design RC structures such as combined footing and retaining wall
CO2	Adopt codal provisions, professional ethics and design water tanks and portal frames
CO3	Evaluate the forces acting on steel roof truss and design by following the codal procedure
CO4	Analyse and design steel structures such as plate and gantry girders carrying moving loads

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	3					3				1	2		
CO2	2	3	3					3				2	2		
CO3	2	2	3					3				2	2		
CO4	2	2	3					3				1	2		
Average	2	2.25	3					3				1.5	2		

Subject: Air Pollution and Control	Subject Code: 18CV732
Course Outcomes	
CO1	Identify and classify the sources of air pollutants
CO2	Predict the effects of air pollutants on human health and environment.
CO3	Apply and relate the significance of various air pollution dispersion models.
CO4	Analyze the air quality and relate with air pollution regulation
CO5	Design various air pollution control equipment and evaluate its use

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2				2	2					2		2	
CO2	3	2				2	2					2		2	
CO3	3	2				2	2					2		2	
CO4	3	2				2						2		2	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bangalore-560 060

CO5	3	2					2					2		3	
Average	3	2				2	2					2		2.75	

Subject: Pavement Materials and Construction													**Subject Code: 18CV733**		
Course Outcomes															
CO1	Evaluate and assess the suitability of any pavement material to be used in various components of pavement by conducting required tests as per IS, IRC specifications														
CO2	Formulate the proportions of different sizes of aggregates to suit gradation criteria for various mixes as per MORTH and also design bituminous mixes.														
CO3	Different highway construction equipment with their suitability and adaptability in various field scenarios.														
CO4	Competent to adapt suitable modern techniques and equipment for speedy and economic construction.														
CO5	Execute the construction of embankment, flexible, rigid pavement and perform required quality control tests at different stages of pavement construction														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	2					1	2				1		2	
CO2	1	2		3								1		2	
CO3	1			3								1		2	
CO4			3									1		2	
CO5		1				2	1	1	1			1		2	
Average	1	1.66	3	3		2	1	1.5	1			1		2	

Subject: Environment Protection and Management													**Subject Code:** 18CV753		
Course Outcomes															
CO1	Develop and apply engineering knowledge in corporate and environmental management systems to international environmental management system standards														
CO2	Choose and implement pollution prevention and waste minimization options for sustainable development.														
CO3	Lead pollution prevention assessment team ad develop, implement maintain and audit environmental management systems for organization														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3			2	2	2	2	2	2		2		2	
CO2	3	3			2	3	2	2	2	2		2		2	
CO3	3	3			2	3	2	2		2		2		2	
Average	3	3			2	2.6	2	2	2	2		2		2	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

Subject: Urban Transportation and Planning												Subject Code: 18CV745			
Course Outcomes															
CO1	Identify urban transport problems and conduct necessary surveys to provide the data required for transportation planning.														
CO2	Develop travel demand models to determine future trip generation rate, trip distribution and model split for specific types of land use development.														
CO3	Identify urban transport corridors and validate the developed model for long term transportation plan.														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3										1			1	
CO2	2	2				1					1			2	
CO3	2	2				1					1			2	
Average	2.3	2				1					1			1.7	

Subject: Geotechnical Engineering Laboratory												Subject Code: 18CVL77			
Course Outcomes															
CO1	Acquire capability to conduct experiments and estimate the concentration of different parameters														
CO2	Compare the result with standards and discuss based on the purpose of analysis														
CO3	Determine type of treatment degree of treatment for water and wastewater.														
CO4	Identify the parameter to be analysed for student project work in environmental stream														
CO5															
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	2			2		2	2				3	
CO2	2	2				2	2	2	1	2				3	
CO3	2	2	2	2		2	2	2		1				3	
CO4	2	2	2	2	2	2	2	2	2			3		2	
CO5															
Average	2.2	2	1.6	2	2	2	2	2	1.6	1.6		3		2.7	

Subject: Computer Aided Detailing of Structures												Subject Code: 18CVL76			
Course Outcomes															
CO1	Acquire proficiency over software skills														
CO2	Out line the principles as per codal provision														
CO3	Develop detailed working drawing of RC and Steel structures														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2					1	2	3				2	3	1	
CO2	3	3	3					3				2	3	1	
CO3	3	3	3					3				2	3	1	
Average	2.66	3	3			1	2	3				2	3	1	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

Semester-VIII

Subject: Design of Pre-Stressed Concrete Elements	Subject Code: 18CV81
Course Outcomes	
CO1	Identify suitable materials and methods of prestressing.
CO2	Analyse the stresses, losses and deflections in the pre-stressed beams.
CO3	Analyse and design the pre-stressed concrete members for Flexure and Shear Strength.
CO4	Analyse anchorage system and design of end block of PSC members.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2											2		
CO2	3	3	2					2					2		
CO3	2	3	3					3					2		
CO4	2	3	3					2					2		
CO5															
Average	2.25	2.75	2.67					2.33					2		

Subject: Rehabilitation and Retrofitting of Structures	Subject Code:18CV824
Course Outcomes	
CO1	Understand the cause of deterioration of concrete structures
CO2	Assess the damage of different types of structures and recommend the necessary solution
CO3	Summarize the principles of repair and rehabilitation of structures
CO4	Recognize ideal material for different repair and retrofitting technique

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2											2		
CO2	2	2	3			1		1					2		
CO3	2	2	2			1		1					2		
CO4	2	2	2								1		2		
Average	2	2	2.33			1		1			1		2		

Subject: Pavement Design	Subject Code: 18CV825
Course Outcomes	
CO1	Systematically generate and compile required data's for design of pavement (Highway & Airfield).
CO2	Analyze stress, strain and deflection by Boussinesq's, Burmister's and Westergaard's theory
CO3	Design rigid pavement and flexible pavement conforming to IRC58-2002 and IRC37-2001.
CO4	Evaluate the performance of the pavement and also develops maintenance statement based on site specific requirements.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2					1						1	
CO2	2	2	2	3									2	3	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060

CO3	2	2	2	2									2	2	
CO4		2		3										1	
Average	2.33	2	2	2.66				1					2	1.75	

Subject: Internship/Professional Practice												**Subject Code:** 18CV84			
Course Outcomes															
CO1	Assess interests and abilities in their field of study														
CO2	Learn to appreciate work and its function in the economy														
CO3	Develop communication, interpersonal and other critical skills														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2			2	2	2	2	2	2		2	2		
CO2	2	2			2	2	2	2	2	2		2	2		
CO3	2	2			2	2	2	2	2	2		2	2		
Average	2	2			2	2	2	2	2	2		2	2		

Subject: Project Phase II												**Subject Code:** 18CVP83			
Course Outcomes															
CO1	Formulate the project objective by detailed literature review														
CO2	Conduct the experimental/analytical work to achieve the objectives														
CO3	Prepare the detailed report based on the experimental/analytical work														
CO4	Communicate and present the project at different platforms														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3		1	1								3	3	
CO2				3	2								3	3	
CO3	2	2	2	2	3		1			3			3	3	
CO4	2	2	2	2	3		1			3			3	3	
Average	2	2.33	2	2	2.25		1			3			3	3	

Subject: Seminar												**Subject Code:**18CVS86			
Course Outcomes															
CO1	Work in actual working environment and utilize technical resources														
CO2	Find appropriate sources that can be summarised, give oral presentations related to the work and integrated into multimedia presentation														
CO3	Engage in independent learning														
CO4	Be aware of importance of access to data, knowledge and results of engineering studies														
CO5	Demonstrate the ability to assess and report														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2					2	2	2				2	2	2	
CO2	2					2	2	2				2	2	2	
CO3	2					2	2	2				2	2	2	
CO4	2					2	2	2				2	2	2	
CO5	2					2	2	2				2	2	2	
Average	2					2	2	2				2	2	2	

Head of Department
Department of Civil Engineering
S J B Institute of Technology
Uttarahalli Road, Kengeri
Bengaluru-560 060