Third Year: 2019 Pattern
Course Outcome and Program Outcome mapping using Competency and Performance Indicator
Semester I
Course Name: Hydrology and Water Resource Engineering

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C301001	**Hydrology and Water Resource Engineering**	CO1	Understand government organizations, the process of precipitation formation and its abstraction
		CO2	Apply hydrological principles to analyze rainfall patterns, runoff generation, and stream flow dynamics in various geographical settings.
		CO3	Analyze the factors influencing flood frequency and magnitude, including climate change, land use changes, and urbanization.
		CO4	Explain the hydrological processes involved in reservoir filling and emptying.
		CO5	Explain the causes, effects, and interactions between water logging, water management practices, and groundwater systems.
		CO6	Apply irrigation design principles to calculate water requirements and system layouts.

CO PO Matrix- Hydrology and Water Resource Engineering

CO301001	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO No	EK	PA	DD	CPI	MTU	E&S	ES	Eth	TW	Com	PMF	LL			
C301001.1	2	2	2	3	2	2	3	3	2	3	2	3	3	3	3
C301001.2	2	2	2	3	2	2	3	3	2	3	2	3	3	3	3
C301001.3	3	3	2	3	2	2	3	3	2	3	1	3	3	3	3
C301001.4	2	2	2	3	-	2	3	3	2	3	2	3	3	3	3
C301001.5	3	2	2	2	-	2	3	3	2	3	2	3	3	3	3
C301001.6	2	1	2	2	2	2	3	3	2	3	2	3	3	3	3
Avg C301001	2.33	2.13	1.75	2.66	3.00	2.00	3.00	3.00	2.00	3.00	1.83	3.00	3.00	3.00	3.00

Course Name: Water Supply Engineering

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C301002	**Water Supply Engineering**	CO1	Define identify, describe reliability of water sources, estimate water requirement for various sectors
		CO2	Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics
		CO3	Design various components of water treatment plant and distribution system
		CO4	Understand and compare contemporary issues and advanced treatment operations and process available in the market, including packaged water treatment plants
		CO5	Design elevated service reservoir capacity and understand the rainwater harvesting .
		CO6	Understand the requirement of water treatment plant for infrastructure and Government scheme

CO PO Matrix- Water Supply Engineering

CO301002	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO No	EK	PA	DD	CPI	MTU	E&S	ES	Eth	TW	Com	PMF	LL			
C301002.1	3	2	1	3	-	3	3	3	2	3	1	3	3	3	2
C301002.2	3	3	2	3	-	3	3	2	2	3	2	3	3	3	3
C301002.3	3	3	3	3	-	3	3	2	2	3	2	2	3	3	3
C301002.4	3	3	3	2	-	3	3	2	2	3	2	2	3	3	3
C301002.5	3	3	1	3	-	3	3	2	2	3	1	3	3	3	3
C301002.6	3	3	3	2	-	3	3	2	2	3	2	2	3	3	3
Avg C301002	3	2.75	2.13	2.67	-	3	3	1.75	2	3	1.67	2.5	3.00	3.00	2.83

Course Name: Design of Steel Structures

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C301003	**Design of Steel Structures**	CO1	**Understand** the various design philosophies' required to **design** the STEEL structures, apply relevant IS provisions to ensure safety and serviceability.
		CO2	**Identify** the modes of failure using LSM and **evaluate** moment of resistance for Various sections.
		CO3	**Analysis** and **design** of Slab bases and Column bases
		CO4	**Design** of flexural member using various supported and Unsupported Conditions
		CO5	**Apply** the concepts to analysis and design of Plate Girder
		CO6	**Analysis** and **design** of roof truss and Gantry Girder.

CO PO Matrix- Design of Steel Structures

CO301003	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO No	EK	PA	DD	CPI	MTU	E&S	ES	Eth	TW	Com	PMF	LL			
C301003.1	2	3	2	3	2	3	2	3	2	3	1	2	3	3	2
C301003.2	3	3	3	3	3	3	3	3	2	3	1	3	3	3	3
C301003.3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3
C301003.4	3	3	3	3	3	3	3	3	3	3	1	3	3	3	3
C301003.5	3	2	2	3	2	3	2	3	3	3	1	2	3	3	3
C301003.6	3	3	3	3	3	3	3	3	2	3	2	3	3	3	3
Avg C301003	**2.8**	**2.8**	**2.5**	**3**	**2.7**	**3**	**2.7**	**3**	**2.5**	**3**	**1.3**	**2.7**	**3**	**3**	**2.8**

Course Name: Engineering Economics and Financial Management

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
301004	**Engineering Economics and Financial Management**	CO1	Understand basics of construction economics.
		CO2	Develop an understanding of financial management in civil engineering projects.
		CO3	Prepare and analyze the contract account.
		CO4	Decide right source of fund for construction projects.
		CO5	Understand working capital and its estimation for civil engineering projects.
		CO6	Illustrate the importance of tax planning & understand role of financial regulatory bodies

CO PO Matrix- Engineering Economics and Financial Management

CO 301004	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO No	**EK**	**PA**	**DD**	**CPI**	**MTU**	**E&S**	**ES**	**Eth**	**TW**	**Com**	**PMF**	**LL**			
C 301004.1	2	1	-	1	1	2	-	2	-	1	3	-	1	2	2
C 301004.2	1	1	-	1	1	2	-	2	1	1	3	-	1	2	2
C 301004.3	1	1	-	1	1	-	-	2	1	1	3	-	1	2	2
C 301004.4	2	1	-	1	1	2	-	2	-	1	3	-	1	2	2
C 301004.5	1	1	-	1	-	2	-	2	-	1	3	-	1	2	2
C 301004.6	1	1	-	1	1	2	-	2	-	1	3	-	1	2	2
Avg C301004	**1.33**	**1.00**	**--**	**1.00**	**1.00**	**2.00**	**--**	**2.00**	**1.00**	**1.00**	**3.00**	**--**	**1.00**	**2.00**	**2.00**

Elective I

Course Name: Research Methodology and IPR

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C 301005 b	**Research Methodology and IPR**	CO1	Understand Research Problem for Civil Engineering domain
		CO2	Analyse the available literature for given research problem and illustrate different technique for literature survey thereby gap identification
		CO3	Recognize the importance of data collection and investigate the statastical and reliability methods of preliminary data analysis
		CO4	Explain the important concept of interpretation and develop technical writing and presentation skill.
		CO5	Comprehend the various forms of intellectual property, its relevance, and business impact in changing global business environment.
		CO6	Realize the importance of patent, trademarks and copyrights and follow research ethics\

CO PO Matrix- Research Methodology and IPR

CO301005b	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO No	**EK**	**PA**	**DD**	**CPI**	**MTU**	**E&S**	**ES**	**Eth**	**TW**	**Com**	**PMF**	**LL**			
C301005b.1	3	2	2	3	3	3	3	3	3	3	1	3	3	3	3
C301005b.2	3	3	2	3	3	3	2	3	3	3	1	3	3	3	3
C301005b.3	3	3	3	3	3	3	2	3	3	3	1	3	3	3	3
C301005b.4	3	3	2	3	3	3	2	3	3	3	1	3	3	3	3
C301005b.5	3	3	3	3	3	3	1	3	3	3	1	3	3	3	3
C301005b.6	3	3	3	3	3	3	2	3	3	3	1	3	3	3	3
Avg C301005b	**3**	**2.75**	**2.63**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**1**	**3**	**3.00**	**3.00**	**3.00**

Elective I

Course Name: Construction Management

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C 301005 c	**Construction Management**	CO1	Understand the overview of construction sector.
		CO2	Illustrate construction scheduling, work study and work measurement.
		CO3	Acquaint various labor laws and financial aspects of construction projects.
		CO4	Explain elements of risk management and value engineering.
		CO5	State material and human resource management techniques in construction.
		CO6	Understand basics of artificial intelligence techniques in civil engineering.

CO PO Matrix- Construction Management

CO301005c	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO No	**EK**	**PA**	**DD**	**CPI**	**MTU**	**E&S**	**ES**	**Eth**	**TW**	**Com**	**PMF**	**LL**			
C301005c.1	2	2	3	2	-	2	1	2	2	3	2	3	3	2	3
C301005c.2	3	3	3	3	3	2	-	-	2	2	3	3	3	2	3
C301005c.3	2	2	1	2	-	3	3	3	3	3	-	3	3	2	3
C301005c.4	3	3	3	2	1	2	-	-	2	1	3	3	2	2	3
C301005c.5	3	3	3	3	3	-	1	2	2	2	3	2	2	2	3
C301005c.6	2	3	1	2	3	-	-	-	1	1	-	2	-	2	2
Avg C301005c	**2.5**	**2.6**	**2.3**	**2.3**	**1.67**	**1.25**	**0.8**	**1**	**2.00**	**2**	**1.83**	**2.67**	**2.17**	**2.00**	**2.83**

Elective I

Course Name: Advanced Concrete Technology

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C 301005d	**Advanced Concrete Technology**	CO1	**Understand** the chemistry of cement and its effect on properties of concrete
		CO2	**Apply** the knowledge of supplementary cementitious materials to produce sustainable concretes
		CO3	**Understand** the mechanism of working of admixtures and their effect on properties of concrete
		CO4	**Evaluate** the characteristic properties of fiber reinforced concrete
		CO5	**Understand** the durability properties of concrete
		CO6	Interpret the properties of concrete through advance testing methods

CO PO Matrix- Advanced Concrete Technology

CO301005d	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO No	**EK**	**PA**	**DD**	**CPI**	**MTU**	**E&S**	**ES**	**Eth**	**TW**	**Com**	**PMF**	**LL**			
C301005d.1	2	-	-	3	-	-	1	2	1	1	-	1	3	2	3
C301005d.2	2	-	-	3	-	2	-	-	2	1	-	1	3	2	2
C301005d.3	2	1	1	2	2	3	-	-	2	1	-	2	3	3	3
C301005d.4	1	1	-	2	1	2	-	-	-	2	-	1	2	2	3
C301005d.5	2	3	2	3	1	3	1	3	2	2	1	2	3	3	3
C301005d.6	1	1	1	2	-	2	2	-	-	1	-	1	2	2	2
Avg C301005d	**1.67**	**1.50**	**1.33**	**2.50**	**1.33**	**2.40**	**1.33**	**2.50**	**1.75**	**1.33**	**1.00**	**1.33**	**2.67**	**2.33**	**2.67**

Semester II

Course Name: Waste Water Engineering

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C 301012	Waste Water Engineering	CO1	Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams
		CO2	Design preliminary and primary unit operations in waste water treatment plant
		CO3	Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process
		CO4	Understand and design suspended and attached growth wastewater treatment systems
		CO5	Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems
		CO6	Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment

CO PO Matrix- Waste Water Engineering

CO301012	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO No	EK	PA	DD	CPI	MTU	E&S	ES	Eth	TW	Com	PMF	LL			
C301012.1	3	2	3	2	1	3	3	3	2	2	1	2	3	3	3
C301012.2	3	3	3	2	1	3	3	2	2	2	-	2	3	3	3
C301012.3	3	3	3	2	1	3	3	2	2	2	-	2	3	3	3
C301012.4	3	3	3	2	1	3	3	2	2	2	-	2	3	3	3
C301012.5	3	3	3	2	1	3	3	2	2	2	-	3	3	3	3
C301012.6	3	3	3	2	1	3	3	2	2	2	-	2	3	3	3
Avg C301012	**3.00**	**2.75**	**3.00**	**2.00**	**1.00**	**3.00**	**3.00**	**1.75**	**2.00**	**2.00**	**0.17**	**2.167**	**3.00**	**3.00**	**3.00**

Course Name: Design of RC Structures

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C301013	**Design of RC Structures**	CO1	Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and evaluate moment of resistance of beam sections.
		CO2	Design & detailing of rectangular one way and two-way slab with different boundary conditions
		CO3	Design & detailing of dog legged and open well staircase
		CO4	Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion
		CO5	Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings
		CO6	Design & detailing of isolated footing and combined footing.

CO PO Matrix- Design of RC Structures

CO301013	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO No	**EK**	**PA**	**DD**	**CPI**	**MTU**	**E&S**	**ES**	**Eth**	**TW**	**Com**	**PMF**	**LL**			
C301013.1	3	3	1	1	1	2	1	2	3	2	3	3	3	3	3
C301013.2	3	3	1	1	1	2	1	2	3	2	3	3	3	3	3
C301013.3	3	3	1	1	2	2	1	2	3	2	3	3	3	3	3
C301013.4	3	3	1	1	1	2	1	2	3	2	3	3	3	3	3
C301013.5	2	1	1	1	-	2	1	2	3	3	2	3	2	2	3
C301013.6	2	1	1	1	-	2	1	2	3	3	2	3	2	2	3
Avg C301013	**2.67**	**2.33**	**1.00**	**1.00**	**1.25**	**2.00**	**1.00**	**2.00**	**3.00**	**2.33**	**2.67**	**3.00**	**2.67**	**2.67**	**3.00**

Course Name: Remote Sensing and GIS

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C301014	**Remote Sensing and GIS**	CO1	Articulate fundamentals and principles of RS techniques.
		CO2	Demonstrate the knowledge of remote sensing and sensor characteristics.
		CO3	Distinguish working of various spaces-based positioning systems.
		CO4	Analyze the RS data and image processing to utilize in civil engineering
		CO5	Explain fundamentals and applications of RS and GIS
		CO6	Acquire skills of data processing and its applications using GIS

CO PO Matrix - Remote Sensing and GIS

CO 301014	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO No	EK	PA	DD	CPI	MTU	E&S	ES	Eth	TW	Com	PMF	LL			
C301014.1	2	3	2	3	3	3	2	2	3	3	1	3	3	3	2
C301014.2	2	3	3	3	3	3	2	2	3	3	1	3	3	3	2
C301014.3	2	3	3	3	3	3	2	2	3	3	1	3	3	3	2
C301014.4	2	3	3	3	3	3	2	2	3	3	1	3	3	3	2
C301014.5	2	3	3	3	3	3	2	2	3	3	1	3	3	3	2
C301014.6	2	3	3	3	3	3	2	2	3	3	1	3	3	3	2
Avg C301014	**2.00**	**3.00**	**2.88**	**3.00**	**3.00**	**3.00**	**2.00**	**1.50**	**3.00**	**3.00**	**1.00**	**3.00**	**3.00**	**3.00**	**2.00**

Elective II

Course Name: Advanced Surveying

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C301015 c	**Advanced Surveying**	CO1	**Recognize** the concept of triangulation for fixing the ground control points.
		CO2	**Differentiate** most probable values for different measurement and adjust those in a given figure.
		CO3	**Summarize** the concepts of astronomical and hydrographic surveying.
		CO4	**Demonstrate** the use of aerial photographs for mapping.
		CO5	**Analyze** use of modern surveying instruments in the field.
		CO6	**Execute** GPS and the associated software for different applications in civil engineering.

CO PO Matrix- Advanced Surveying

CO301015c	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO No	EK	PA	DD	CPI	MTU	E&S	ES	Eth	TW	Com	PMF	LL			
C301015c.1	3	2	2	3	3	3	3	3	3	3	2	3	3	3	3
C301015c.2	3	3	3	2	3	3	-	2	3	3	-	2	3	3	3
C301015c.3	3	3	2	3	2	2	1	2	3	3	2	3	3	3	3
C301015c.4	2	3	2	2	3	2	3	2	3	3	1	2	3	3	3
C301015c.5	2	3	2	3	2	3	2	3	3	3	2	3	1	3	3
C301015c.6	2	2	2	3	3	3	1	2	2	2	1	-	3	3	3
Avg C301015c	**2.5**	**2.66**	**2.16**	**2.66**	**2.66**	**2.66**	**2**	**2.33**	**2.83**	**2.83**	**1.6**	**2.6**	**2.66**	**3**	**3**

Elective II

Course Name: Architecture and Town Planning

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C301015e	**Architecture and Town Planning**	CO1	Analyze architectural principles, urban planning roles, and sustainable design to create user-centric, resilient spaces for future needs.
		CO2	Apply the principles of landscaping to improve quality of life
		CO3	Understand scope of town planning, components, levels, and legal frameworks
		CO4	Analyze the organization of different planning agencies and use various types of civic survey for preparation of any plan.
		CO5	Understand key regulations and land acquisition principles to design sustainable urban spaces.
		CO6	Use different planning strategy with respect to their function, application and limitation.

CO PO Matrix- Architecture and Town Planning

CO301015e	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO No	EK	PA	DD	CPI	MTU	E&S	ES	Eth	TW	Com	PMF	LL			
C301015e.1	2	2	1	2	-	3	3	3	2	3	2	3	3	3	3
C301015e.2	2	2	2	2	-	3	3	3	3	3	2	2	3	3	3
C301015e.3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3
C301015e.4	2	2	2	2	1	3	3	3	-	2	2	3	2	3	3
C301015e.5	2	2	2	2	-	3	3	3	2	3	2	3	3	2	3
C301015e.6	2	2	-	2	2	3	3	3	3	3	2	2	3	3	3
Avg C301015e	**2.16**	**2.16**	**1.75**	**2.16**	**2.00**	**3.00**	**3.00**	**3.00**	**2.60**	**2.83**	**2.17**	**2.67**	**2.83**	**2.83**	**3.00**

Elective II
Course Name: Solid Waste Management

Course Code	Course Name	Course Outcomes	
At the end of the course, the learners will be able to			
C 301015 f	**Solid Waste Management**	CO1	Explain solid waste management systems with respect to its generation rate (quantity), sampling, characteristics and regulatory/legal requirements
		CO2	Explain and suggest relevant method of storage, collection and transportation of solid waste for the given site condition with justification
		CO3	Develop understanding of technological applications for processing and material recovery from solid waste with its economics and design composting system for organic waste
		CO4	Describe the fundamental and technological aspects of waste to energy systems from solid waste and to design anaerobic digester and incineration systems
		CO5	Analyze the design, operation, and maintenance of sanitary landfill and management of legacy waste
		CO6	Explain the functional element for management of special waste and suggest the relevant method of reuse and recycling for the given type of waste in the given situation

CO PO Matrix- Solid Waste Management

CO301015f	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO No	EK	PA	DD	CPI	MTU	E&S	ES	Eth	TW	Com	PMF	LL			
C301015f.1	3	2	1	3	-	3	3	2	3	3	1	2	3	3	3
C301015f.2	2	2	2	2	3	3	3	2	3	3	2	2	3	3	3
C301015f.3	3	2	3	3	-	3	3	2	2	3	2	2	3	3	3
C301015f.4	3	3	3	3	-	3	3	2	2	3	1	2	3	3	3
C301015f.5	3	3	3	3	2	3	3	2	2	3	1	2	3	3	3
C301015f.6	2	2	2	2	-	3	3	2	2	3	2	2	3	3	3
Avg C301015f	**2.7**	**2.5**	**2.25**	**2.67**	**0.83**	**3**	**3**	**1.5**	**2.33**	**3**	**1.5**	**2**	**3.00**	**3.00**	**3.00**