Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E.-I (Civil)

Programme Specific Outcome(PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

F.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective / Foundation~~** **AMT 1101: APPLIED MATHEMATICS-I**	**Credits / Hours per week**	**04**
Semester	**I**	Year of Introduction: 2010 Year of Syllabus Revision: 2016	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lecture		

Course Outcome (CO) (AMT1101)

CO1 Evaluate successive differentiation of given function and solve identities involving higher order derivatives, evaluate radius of curvature, obtain Taylor & Maclaurin series expansion of function of single variable. Evaluate limits of indeterminate forms.

CO2 Test for convergence sequences and positive term series using various tests like comparison test, ratio test. Also find the convergence, absolute and conditional convergence for alternating series.

CO3 Understand the requirement of complex numbers their various representations, Demovier's theorem and its applications. Logarithm of complex numbers. Evaluate and use circular functions, hyperbolic functions.

CO4 Classify the differential equations with respect to their order and linearity, explain the meaning of different types of solutions of a differential equation.

CO5 Identify and solve the 1st order differential equations.

CO6 Apply the method of undetermined coefficients to solve the non-homogeneous linear differential equations with constant coefficients.

CO7 Apply the method "variations of parameters" to find to solution of higher-order linear differential equations with variable coefficients.

CO8 Solve the Cauchy-Euler equations and systems of linear differential equations .

CO9 Analyze real-world problems in field of Engineering like problems related to bending of beams, mixtures, growth and decay, heating and cooling, electric circuits, Spring-mass system etc.

CO10 Find series solutions of Bessel differential equation and Legendre's differential equations and make use of the properties of Bessel's functions and Legendre polynomials to study and analyze the solution.

Unit	Topic	Contact	Weightage	BT	CO	PSO	Element	Relevan	Relation

No.		Hours	(%)	Level			s of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	ce to Local (L)/ National (N)/ Regional (R)/Global (G)	to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Calculus:** Reorientation, Functions of one variable Application of derivatives, Curvature, Successive differentiation, Partial derivatives, Leibnitz rule for the nth order derivative of a function, Techniques of partial derivatives.	8	16.67	1,2,3,5	CO1	PSO1	Emp, SD	G	PE
2	**Infinite Series:** Sequence and their convergence , convergence and divergence of infinite series, Geometric series, P – Series ,Necessary condition for convergence, Comparison test, ratio test Absolute convergence and conditional convergence of alternating series, Maclauarin's & Taylor's expansion with reminder form, Indeterminate forms L'Hospital's rule	8	16.67	1,2,3,4	CO2	PSO1			
3	**Complex Numbers:** Complex numbers & their geometrical representation, Complex numbers in polar form, Demoivre's theorem and its applications, Exponential, logarithmic, trigonometric & hyperbolic functions.	8	16.67	1,2,3,4	CO3	PSO1			
4	**Differential Equations**	8	16.67	1,2,3,5	CO4	PSO1			

	Reorientation, Modeling of engineering systems pertaining to first order differential equations, Exact differential equations, integrating factors, Unified approach to first order ordinary differential equations, Equations of first order and higher degree.				CO5 CO9				
5	Linear differential equations of higher order with constant coefficients and with variable coefficients Models of higher order differential equations, Method of variation of parameters, Simultaneous linear differential equations Method of solution in series	10	20.83	1,2,3,5	CO6 CO7 CO8 CO9	PSO1			
6	Bessel and Legendre's equations, Properties of Bessel functions Introduction to Legendre polynomials	6	12.5	1,4,5	CO10				

Reference Books

1.	Erwin Kreyszing :	Advanced Engineering Mathematics, (6th edition) Johnwilley&Sons.,1988
2.	Donald Greenspan :	Introduction to Partial Differential Equations, Mc. Graw – Hill Inc., 2012
3.	C. R. Wylie :	Advanced Engineering Mathematics,Mc. Graw – Hill Inc., 1986
4.	G. B. Thomas, R. L. Finney :	Calculus and Analytic Geometry, Addison-Wesley Publishing Co., 2010
5.	J. W. Brown, R.V. Churchill :	Complex variables and Applications, McGraw-Hill Higher Education, 2013.
6.	P. V. O'Neil :	Advanced Engineering Mathematics, Cengage Learning (India edition), 1991.
7.	B. V. Ramana :	Higher Engineering Mathematics, Tata Mc. Graw – Hill. (Core Engineering Series), 2006.
8.	David V. Widder :	Advanced Calculus, Prentice Hall of India Pvt. Ltd., 1986.

NOTE : NO TERMWORK FOR THIS SUBJECT

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Program Name: Bachelor of Civil Engineering

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

F.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**~~Core / Elective /~~ Foundation** **APH1101: Applied Physics I**	**Credits / Hours per week**	**04**
Semester	**I**	Year of Introduction: 2007 Year of Syllabus Revision: 2012	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) APH1101

CO1 Understand the basics of laws governing physical world.

CO2 Application of physical laws in various engineering applications

Unit No.	**Topic/Unit**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Develop	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G) develop	**Relation to** Gender (G), Environment and Sustainability (ES),

							ment (SD)	mental needs	Human Values (HV)and Professional Ethics (PE)
1	**Interference:** • Types of interference. Fresnel's biprism, White light fringes, Determination of the thickness of a thin sheet of transparent material. • Interference in thin films, Wedge-shaped film, Necessity of an extended source. • Newton's rings, Determination of wave-length of sodium light using Newton's rings, Determination of refractive index of a liquid, Newton s rings with white light. • Non-reflecting films, Michelson interferometer, Types of fringes, Uses of Michelson's interferometer, Standardization of the meter. • Fabry-Perot interferometer, Interference filters.	06	10	1,2	CO1 CO2	PSO1	EMP, ENT, SD	N,R,G	ES, PE
2	**Diffraction:** • Introduction, Two kinds of diffraction, Difference between interference and diffraction. • Fraunhofer diffraction at a circular aperture, Plane diffraction grating, Formation of multiple spectra with grating, Maximum number of orders available with a grating. • Absent spectra with a diffraction grating, Effect of increase in the width of niled surface. • Determination of wavelength, dispersive power of grating.	06	10	1,2	CO1 CO2	PSO1			
3	**Resolving Power of Optical Instruments:** • Meaning of resolving power, Rayleighs criterion of	06	06	1,2	CO1	PSO1			

	resolution. • Resolving power of grating, prism, telescope and microscope.				CO2				
4	**Polarization:** • Geometry of calcite crystal, double refraction, Nicol's prism, Huygen's theory of double refraction. • Quarter-wave plate, polarization by selective absorption. Half-wave plate. • Elliptically and circularly polarized light, production of circularly and elhptically polarized light, conversion of elliptically polarized light into circularly polarized light, analysis of polarized light of different kinds. • Ken effect. Optical activity, specific rotation, Laurent's half shade polarimeter. Photo elasticity.	04	10	1,2	CO1 CO2	PSO1			
5	**LASER:** • Lasers, spontaneous and stimulated emission, population inversion, pumping and active system. • The Ruby laser. Gas laser. Semiconductor laser. • CO2 laser, design of CO2 laser, mechanism of CO2 laser. • Uses of lasers.	05	10	1,2,3,4	CO1 CO2	PSO1			
6	**Semiconductor Diode Applications and Solar Cells:** • Rectifier, ripple factor, capacitor filter. • Types of Solar Cells, p-n junction Solar Cells Characteristics, Efficiency.	03	04	1,2,3,4	CO1 CO2	PSO1			
7	**Ultrasonics:** • Ultrasonic waves, production of ultrasonic waves. • Detection of ultrasonic, properties of ultrasonic, wavelength of ultrasonic waves.	08	10	2,3,4,5	CO1 CO2	PSO1			

	• Applications of ultrasonic waves.								
8	**Maxwell's equations and electromagnetic waves:** • Vector field, Irrotational vector field, rotational vector fields (curl), source and sinks of vector fields - divergence theorem. • Basic laws of electricity and magnetism- different forms. • Lumped and distributed elements -oscillations, electromagnetic cavity oscillator. • Charge conservation law —continuity equation, displacement current. • Maxwell's equations, electromagnetic waves in free space.	08	10	2,3,4,5	CO1 CO2	PSO1			
9	**Waves and Particles:** • Equation of motion of matter waves, physical interpretation of wave function • Operators. Eigen functions and Eigen values, momentum and energy operators, properties of wave functions • Solution of Schrodinger equation. Stationary state solutions. • The free particle, particle in a box, energy levels of a particle enclosed in one-dimensional potential box of infinite height. • The hydrogen atom (qualitative). Barrier Tunneling, STM, electron microscope.	08	10	2,3,4,5	CO1 CO2	PSO1			
10	**Temperature and its measurement:** • Liquid thermometers, mercury thermometers, errors in mercury thermometers. • Bimetallic thermometers. Platinum resistance thermometers, thermoelectric thermometers, Pyrometers, Fery's total radiation pyrometer. Disappearing filament optical pyrometer. • Factors for the selection of a thermometer for a particular use, temperature range of various	03	10	2,3,4,5	CO1 CO2	PSO1			

	thermometers.								
11	**Vacuum technology:** • Introduction, exhaust pump and their characteristics, different types of pumps. • Rotary oil pumps. Diffusion pump. • Measurement of low pressure, Pirani gauge.	03	10	2,3,4,5	CO1 CO2	PSO1			

Reference Books

1.	Engineering Physics: by R. K. Gaur and S. L. Gupta, DhanpatRai Publications (P) Ltd. 8th Edition.
2.	Fundamentals of Physics: by D. Halliday, R Resnick and J. Walker, Asian Books Pvt. Ltd. 6th Edition
3.	Modem Engineering Physics: by A. S. Vasudeva, S. Chand and Company Ltd.
4.	A Textbook of Engineering Physics by MN Avadhanulu& PG Kshirsagar, S Chand Publishers

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

F.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective / Foundation~~** **APH1101L : Applied Physics Laboratory Practical**	**Credits / Hours per week**	**03**
Semester	**I**	Year of Introduction: ~~2007~~ Year of Syllabus Revision~~: 2016~~	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva		

Course Outcome (CO) APH1101L

CO1 Understanding the optics
CO2 Understanding the physical properties through experiments
CO3 Methods to determine physical properties
CO4 Understanding of advances in instrumentation
CO5 Understanding the spectroscopy

No.	**Experiment**	**Hours**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R) /Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)

1	**Newton's Rings:** To Study the interference patterns from single monochromatic source and find out the Radius of Curvature of given Plano-Convex lens from the obtain interference pattern.	06	1,2	CO1, CO2	PSO1	SD	G	PE
2	**Diffraction Grating:** To study the diffraction pattern from sodium vapor lamp and find out the wavelength of this source by using diffraction pattern that obtain with the help of Transmission Grating.	06	2	CO1 CO2	PSO1			
3	**Frequency of AC Mains:** To determine the frequency of A. C. Mains.	06	2,3	CO3 CO4	PSO1			
4	**Ultrasonic Waves:** To determine the frequency of Ultrasonic waves and find out the velocity of Ultrasonic wave in air medium by using the interference theory of longitudinal wave.	06	3,4		PSO1			
5	**Resolving Power of Telescope:**- Comparative study between resolving power of Travelling Microscope and Telescope.	06	2,3	CO1 CO2	PSO1			
6	**Solar Cell:** Study of various parameters of solar cell	03	2,3		PSO1			
7	**Dispersion of Light:** Calculate the refractive index of different wavelength associated with white light using the prism.	03	3,4		PSO1			
8	**Laser Parameters:** (1) To determine the full angular divergence of the given gas laser. (2) To determine the wavelength of the given laser source using diffraction by grating.	03	3,4	CO5	PSO1			
9	**Polarimeter:** To determine the specific rotation of the given optically active substance.	03	2,3,4	CO1 CO2	PSO1			
10	**Rectifier Circuits:** To study the process of rectification through half wave, full wave and bridge rectifiers.	06	2,3,4	CO3 CO4	PSO1			

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Program Name: Bachelor of Civil Engineering

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

F.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective / Foundation~~** **CVL 1104 : FUNDAMENTALS OF CIVIL AND ENVIRONMENTAL ENGINEERING (NEW COURSE)**	**Credits / Hours per week**	**04**
Semester	**I**	Year of Introduction**: 2019-20** Year of Syllabus Revision:	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) CVL

CO1 To impart brief fundamental concept related to various materials and their use in building construction
CO2 To study environmental pollution comprehensively and
CO3 Students will know concept of linear and angular measurements
CO4 Students will be aware of various constructional practices

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Building Material** Stone - Introduction to stone – Uses of stone – Characteristics of good	14 hrs	27	2,3	CO1	PSO4	(Emp), (Ent),	(L), (N), (R), (G)	(ES), (PE)

	building stone – Availability, suitability and properties of different stone. Bricks - Comparison between stone work and brick work – Advantages of bricks – Characteristics of good brick – Standard test for brick along with field test for brick. Lime - Classification of Lime, Precautions in handling Lime. Cement - Basic ingredient of ordinary cement – Physical properties of cement – Field examinations of cement – Storing of cement and its uses. Timber - Introduction to timber – Importance of seasoning – Wood base product. Steel - Introduction – Use of different form of steel – Marketable forms of steel. Aggregates. Bitumen. FRP. Optical fiber. Plastic - Properties of plastics – Types and uses of plastic.						(SD)		
2	**Environmental Science and Sustainable Development** Introductory Environmental Engineering Terminology— Introduction to various types of pollution- Water and land pollution and remedial measures for control, water and wastewater quality criteria – Disposal of wastes – Air pollution and remedial for control – Ecology, Environmental Protection and legislation. Hydrologic cycle, Rain water harvesting, Green building, Solid waste management, Environment Impact Assessment, Basic environmental chemistry, Sustainable development – clean development mechanism, Global warming, Ozone layer depletion, Acid rain, and Climate change.	12 hrs	23	2,3	CO2	PSO3			
3	**Surveying and Leveling** Surveying - Introduction – Principle – Object of survey – Classification – Basic instruments of linear and angular measurements – chain, tape, Offsetting, Types of offsets, Ranging methods. Prismatic compass, Types of meridians, Types of bearings. Traverse survey: open and closed Examples based on compass. Leveling – Definitions – Computation of reduced levels– Introduction to contour, Methods of leveling and Examples on Level. Modern tools: Introduction to Theodolite, Total station – Introduction to GPS, GIS, Remote sensing.	14 hrs	27	2, 3, 4	CO3	PSO2 PSO3 PSO4			
4	**Building Construction** Building Construction & Infrastructures: Types of constructions – roads, pipelines, transmission lines – Typical details of load bearing and framed structures – Brief discussion and illustrational sketches of typical important building components – Foundation – Functions, Types of foundations such as Spread footing, Stepped footing, Isolated and Combined column footing, Raft, and Grillage foundation. Lintels – Function, Types of lintel. Flooring, Roofing. Mortar and concrete specifications – Ingredients for mortar and concrete – classification of mortar and concrete – selection of mortar and its uses – precaution in	12 hrs	23	1, 2, 3	CO4	PSO2 PSO4			

	using mortar – Pre-stressed concrete – grades of concrete, Internet of things for buildings, Hydropower plants.								

Reference Books

1	Arora S.P. and Bindra S.P. (2012), A text book of Building Construction, Dhanpatai and Sons, Publishers.
2	Rangwala S.C. (2012), A text book of Building Construction, Charotar Publishing House, India.
3	Gilbert M Masters, (2006), Introduction to Environmental Engineering & Science, Prentice Hall of India Pvt. Ltd. New Delhi
4	Deshpande P.D., (2009) Basic Civil Engineering, Nirali Prakashan Pune.
5	G.S.Birdie, Water supply & Sanitary Engg., Dhanpatrai & Sons.
6	S.C.Rangwala, Engg. Materials, Charotar Books Staff, Anand.
7	Janardan Jha Building Material
8	Surendra Singh, Building Material, Vikas Pub. Pvt. New Delhi.
9	D.N.Ghose, Material of Construction, Tata McGraw Hill Pub. Co. Ltd. New Delhi
10	Surveying & Levelling – Kanetkar & Kulkarni Vol-I A.V.G. Prakashan, Puna.
11	Elementary Survey – B.C.Punmia Vol-I. Laxmi Pub. Dariya Gunj, New Delhi.
12	Surveying & Levelling – S.C.Rangwala, Charotar Pub. House, Anand.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

F.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective / Foundation~~** **CVL 1104L : FUNDAMENTALS OF CIVIL AND ENVIRONMENTAL ENGINEERING (NEW COURSE) : Field Practical**	**Credits / Hours per week**	**02**
Semester	**I**	Year of Introduction: **2019-20** Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**

Course Outcome (CO) CVL1104L

CO1 To impart brief fundamental concept related to various materials and their use in building construction
CO2 To study environmental pollution comprehensively and
CO3 Students will know concept of linear and angular measurements
CO4 Students will be aware of various constructional practices

Mode of Transaction	Practical's, discussion and viva	**PSO1 is common for all experiments**

No.	Experiment	Contact Hours	Course Code	BT Level	CO	PSO
1	Conventional signs and symbols, scale, topographic-sheet	2	CVL1104L	1,2,3	CO3	PSO2
2	Linear measurements: tape, ranging, offsets	4	CVL1104L	2,3	CO3	PSO2
3	Compass: Introduction, Bearings	2	CVL1104L	2,3,4	CO3	PSO2
4	Auto level: Introduction, HI, Rise and fall	6	CVL1104L	2,3,4,5	CO3	PSO2
5	GPS : Introduction, and demonstration	2	CVL1104L	2,3,4	CO3	PSO2
6	Theodolite and Total Station demonstration	6	CVL1104L	2,3,4,5	CO3	PSO2
7	Any other term-work based on syllabus	4	CVL1104L	1,2	CO1 CO4	PSO2, PSO4

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Program Name: Bachelor of Civil Engineering

Programme Outcomes(POs)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

F.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**~~Core~~ / ~~Elective~~ / Foundation** **MEC 1101: Engineering Drawing I**	**Credits / Hours per week**	**Lectures: 04** **Practical-: 04**
Semester	**I**	Year of Introduction: 2016 Year of Syllabus Revision: ----	**Maximum Marks / Grade**	**Theory: 100** **PR/TW/VIVA: 50**
Mode of Transaction		Lectures		

Course Outcome (CO) MEC 1101

CO 1 Use the drawing instruments effectively and how to use the dimensioning methods.
CO 2 Observe, analyze and correlate two-dimensional (Orthographic view) and three dimensional (Isometric view)
CO 3 Construct and application of various engineering curves in engineering practice
CO 4 Apply the knowledge of Projection of points, Lines and Planes in engineering
CO 5 Create freehand sketches of basic machine components

Unit No.	**Topic/Unit**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/ Global (G) developmental needs	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)

1.	Introduction to Engineering Curves: Introduction to conic sections, types of conic sections, eccentricity, construction of conic sections(parabola, ellipse , hyperbola) by different methods, Construction of involutes, construction of cycloid, epicycloid and hypocycloid, construction of spiral, construction of normal and tangent to all curves.	08	20	1,2,6	CO3	PSO1	Emp, Ent, SD	L,N,R,G	G, ES, HV, PE
2.	Free hand sketches: Parts of screw thread and its types, conventional representation of threads, screwed fastening- types of nuts, bolts, set screws, locking arrangement of nuts, foundation bolts, riveted and welded joints, forms and proportions of rivet heads, representation of welded joints, shaft keys and	08	10	1,2,6	CO5	PSO1			

	couplings- types of keys, cotter joint, knuckle joint, double cotter/sleeve joint, types of couplings.								
3.	Projection of Point and Line Introduction to principal planes of projections, projections of points located with respect to reference planes (in different quadrants), Projection of Lines, Line parallel to reference planes, Line parallel to one reference plane and inclined to other reference plane, Line inclined to both the reference planes, Application of all variants	08	20	3,4,6	CO4	PSO1			
4.	Projection of Planes Projection of Planes (Polygons, circle, semi-circle, ellipse etc.). Plane parallel to one reference plane and inclined to other, Plane inclined to both the reference plane, Concept of auxiliary plane method for projection of plane.	08	10	1,2,4	CO4	PSO1			

5.	Orthographic projection Fundamental of projection along with classification, Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method, full sectional view	10	20	2,3,5	CO2	PSO1			
6	Isometric Projections and Isometric View or Drawing: Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing of objects	10	20	2,4,5	CO2	PSO1			
		52	**100**						

Reference book

1.	Bhatt, N.D., ‘Engineering Drawing’,
2.	Shah, P. J., ‘Engineering Drawing’,
3.	Bhatt, N.D., ‘Machine Drawing’,
4.	Dhawan, R.K., ‘A Textbook of Engineering Drawing’,
5.	Venugopal, K., ‘Engineering Drawing and Graphics’
6.	M. Raja Roy, B.V.R. Gupta, ‘Engineering Drawing with AutoCAD’,

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

F.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective / Foundation~~** **MEC 1101L: Engineering Drawing I**	**Credits / Hours per week**	**02**
Semester	**I**	Year of Introduction: **2016** Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**

Course Outcome (CO) MEC 1101

CO 1 Use the drawing instruments effectively and how to use the dimensioning methods.
CO 2 Observe, analyze and correlate two-dimensional (Orthographic view) and three dimensional (Isometric view)
CO 3 Construct and application of various engineering curves in engineering practice
CO 4 Apply the knowledge of Projection of points, Lines and Planes in engineering
CO 5 Create freehand sketches of basic machine components

Mode of Transaction	Practical's, discussion and viva	**PSO1 is common for all experiments**

No.	Experiment	Contact Hours	Course Code	BT Level	CO	PSO
1.	Different types of Engineering Curves:	08	20	1,2,6	CO3	PSO1
2.	Free hand sketches:	08	10	1,2,6	CO5	PSO1
3.	Projection of Point and Line	08	20	3,4,6	CO4	PSO1
4.	Projection of Planes	08	10	1,2,4	CO4	PSO1
5.	Orthographic projection	10	20	2,3,5	CO2	PSO1
6	Isometric Projections and Isometric View or Drawing:	10	20	2,4,5	CO2	PSO1

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B E. (Civil Engineering)

Programme Outcomes(POs)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

F.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Workshop Practice I

Year	**I**	**Core** **MEC 1102 Workshop Practice I**	**Credits / Hours per week**	**Lectures: 00** **Practical-: 03**
Semester	**I**	Year of Introduction: Year of Syllabus Revision: 2018	**Maximum Marks / Grade**	**Theory: NILL** **PR/TW/VIVA: 50**
Mode of Transaction: Lectures and Practical				

Course Outcome (CO) MEC 1102

CO1 Understand carpentry shop work ,different tools ,use of tools and hand on practices of subject.

CO2 Understand Smithy workshop related tools and learning forging operation in workshop .

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)

1	Carpentry: Name, use and setting of hand tools, Construction of halved single mortise and tenon joints, dovetail joint, bridle joint, oblique mortise and tenon joint and rafter joint.	20	50	1,2,3, 4,5,6	Co1	PSO1	All	All	All
2	Smithy: Tools used for preparing simple jobs in hand forging.	19	50	1,2,3, 4,5,6	Co2	PSO1			
		39	100						

Reference Books

1.	Workshop Technology-I. W.A. J. Chapman Taylor & Francis
2.	Comprehensive Workshop Technology (Manufacturing Processes). S.K. Garg Laxmi publications
3.	Workshop practice manual. K.Venkata Reddy B.S.Publications.
4.	Workshop Technology-I. Hazra and Chaudhary Media promoters & Publisher private limited

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: Bachelor of Engineering (Civil) (Regular Programme)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2010-21**

F.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective~~ / ~~Foundation~~** **Code: MME 1101** **Subject**: **Material Science**	**Credits / Hours per Week**	**04** (Theory)
Semester	**I**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**100** (Theory)

Mode of Transactions	Lectures

Course Outcome (CO)

CO-1:Understanding of materials and their classification

CO-2:Study about crystals and lattices parameters

CO-3:Understanding mechanical properties and behavior of these properties on engineering materials

CO-4: Studies of phase importantwith their diagrams and materials defects

CO-5:Learning about ceramics and glasses materials

CO-6: Understanding briefly causes and types of corrosions and their protection methods

CO-7: Study about electronics and electrical materials

CO-8:Learn about some advanced materials and their uses

Unit No.	Topic/Unit	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G) developmental needs	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Introduction of Engineering Materials** Metalica Materials, Ceramic Material, Polymers, Composite and Nano-materials.	04	7.7	1 to 4	CO1	PSO1	SD	G	ES
2	**Crystal Structure** Crystallography, Atomic structure and; Structure of crystalline solids; Lattices, unit cells; Crystal systems, Bravais lattices; Indexing of directions and planes, notations, Inter-planar spacings and angles, co-ordination number, packing factors stacking sequence in BCC, FCC and HCP.	08	15.4	1, 2, 3, 5	CO2	PSO1			
3	**Mechanical Properties of Materials** Concepts of stress and strain, Stress-Strain diagrams; Properties obtained from the tensile test; Elastic deformation, Plastic deformation.	08	15.4	1, 2, 3	CO3	PSO1			

	Impact Testing & toughness behavior. Hardness of materials.								
4	**Phase diagram** Gibbs phase rule, Binary phase diagram its types, solid solution – Hume Rothery Rules. **Imperfections:** Point defects, Line defects and surface defects – grain boundary, tilt boundary and twin boundary, Grain, Grain size number. Burgers vector and its representation.	08	15.4	1, 2, 3	CO4	PSO1			
5	**Ceramic Materials** Introduction, ceramic structures, silicate structures, Processing of ceramics; Properties, glasses; **Composite Materials**- Introduction, classification, metal-matrix, ceramic–matrix and polymer matrix composites.	06	11.5	1, 2	CO5	PSO1			
6	**Corrosion** Types of corrosion – Dry and Wet corrosion, Electro chemical and oxidation (Chemical) corrosion. Corrosion prevention – anodic and cathodic protection & coatings	06	11.5	1, 2, 3	CO6	PSO1			
7	**Electrical & Electronic Materials** Intrinsic and Extrinsic Semi conductivity, Dielectric material, Piezo-electric materials. **Magnetic Materials:** Introduction,	06	11.5	1, 2	CO7	PSO1			

	classification of magnetic materials, soft & hard magnetic materials.								
8	**Advanced Materials** Nano Materials & its application, Metallic glasses, Super conducting material, optic fibers, smart materials.	06	11.5	1, 2	CO8	PSO1			
TOTAL		**52 Hours**	**100%**						

Text Books or Reference Books:

1.	Askeland D.R., & P. P. Fullay (2007), The Science and Engineering of Materials –4th Cengage Learning Publishers
2.	William D. Callister, Jr (2008), Callister's Materials Science and Engineering, (Adopted by R. Balasubramaniam) Wiley-Eastern
3.	A.S. Edelstein and R.C. Cammarata Ed.(1998), Nano Materials: Synthesis, Properties and Applications, Inst. Of Physics Publishing, UK
4.	Raghavan V (2007), Materials Science and Engineering - A First Course, Prentice Hall, India
5.	James F. Shackelford (1996), Introduction to Materials Science for Engineers, Prentice Hall, India

NOTE: FOR THIS SUBJECT THERE IS NO TERM WORK.

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E.-I (Civil)

Programme Specific Outcome(PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

S.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective / Foundation~~** **AMT1201: Applied Mathematics - II**	**Credits / Hours per week**	**04**
Semester	**II**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO)

CO1 Understand and apply the concept of multivariable functions , its differentiability concept and applications of partial derivatives in various engineering problems.

CO2 Able to focus on understanding and applications of gradient, curl and divergence in engineering problems.

CO3 Apply the concept of surfaces and level curves in solid geometry which helps in solving various application of engineering.

CO4 Understand and implement the methods of curve tracing in two – dimensional space.

CO5 Implement various concepts of matrices in engineering problems and able to solve system of linear equations using matrices.

CO6 Apply the idea of Laplace transforms to solve Boundary Value Problems which occur in almost every problem of engineering.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability	**Relevance to** Local (L)/	**Relation to** Gender (G),

							(Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	National (N)/ Regional (R)/Global (G)	Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Partial Differentiation:** Function of two variables – Definition, limit, continuity and partialderivatives Chain rule Euler's theorem, implicit functions differentials Applications of partial derivatives (Tangent plane and normal line,approximation, maxima and minima, Lagrange's multiplier's method), Jacobians and transformations	12	24	1,2,3	CO1	PSO1	Emp / Ent	N / G	PE
2	**Vector Calculus:** Reorientation, scalar and vector fields gradient of a scalar function, Directional derivative divergence and curl of a vector field and their applications	05	11	1,2,3	CO2	PSO1			
3	**Analytical Geometry:** Reorientation, curvilinear coordinates (polar, cylindrical andspherical), cone, cylinder Conicoids, Surfaces and solids of revolutions	10	20	2, 3, 4,5	CO3, CO4	PSO1			
4	Tangent planes and normal lines to above surfaces (by calculusmethod Tracing of curves:	07	15	2, 3, 4,5		PSO1			

	Cardiod, cycloid, lemniscates, spiral, four leaved rose								
5	**Rank of a matrix** solution of homogeneous and non – homogeneous systems of linear equations Eigen values and eigen vectors of a matrix Cayley – Hamilton theorem	07	15	1, 2, 3,5	CO5	PSO1			
6	**Laplace Transforms** Laplace transforms of elementary functions inverse Laplace transforms, linearity property, first and secondshifting theorem. Laplace transforms of derivatives and integrals, applications of Laplace transform in solving ordinary differential equations.	07	15	1,2,3,4,5	CO6	PSO1			

Reference Books

1.	**Erwin Kreyszig: Advanced Engineering Mathematics, (6th edition) John-Wiley & Sons.**
2.	Srivastava, Dhavan **:** Text Book of Engineering Mathematics, Dhanpat Rai & Sons.
3.	Shantinarayan **:** Differential Calculus, S. Chand & Co. New Delhi.
4.	Willfred Kaplan **:** Advanced Calculus, Addison Weseley Publ. Company, Inc.
5.	C. R. Wylie **:** Advanced Engineering Mathematics, Mc. Graw – Hill, Inc.

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil) Regular Programme

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

S.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**~~Core / Elective~~ / Foundation** **APM1201:APPLIED MECHANICS**	**Credits / Hours per week**	**04**
Semester	**II**	Year of Introduction: 2010 Year of Syllabus Revision: -----	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) APM1201

CO1: Student will learn different various types of forces and force system. Effect of Force system and Equilibrium condition the factor affecting the Equilibrium.

CO2: Understanding of the axial forces in Plane and Space truss. Analysis of problems by analytical and Graphical Method.

CO3: Student will be able to learn of the Center of Gravity and Moment of Inertia of any type of the section of the body.

CO4: Refreshes the basics of theory of machine.

CO5: Analysis and evaluation of number of Teeth on the wheel and its rotation in the body.

CO6: Refreshes the effects on body when kinetics and kinematics forces acting on the body. Analysis of D'Alembert's principle, work, power and energy. Impulse and momentum, Equations of motion, Translation, Fixed axis rotation and Problems involving friction.

CO7: student will understand basic stress system and elastic constants in brittle and ductile materials.

CO8: Application of frictional force on inclined planes etc. by applying static conditions of equilibrium.

Unit No.	**Topic/Unit**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employa	**Relevance to** Local	**Relation to** Gender

							bility (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	(L)/ National (N)/ Regional (R)/Global (G) developmental needs	(G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics(PE)
1	**Statics: Introduction, Forces and Force system** Introduction to the subject of applied mechanics and its various branches. SI units. Coplanar, concurrent and non-concurrent force systems. Resultant and Resolutions, Forces in space. Vectors. Operations on forces using vectors. Moment of force, Varignon's theorem, Couple and its properties, Resultant of a coplanar force system. Concentrated and uniform loads. Resultant of a spatial force system. Wrench resultant, Equilibrium of a particle. External & internal forces, Equilibrium of rigid Body, Types of supports. Structural members and beams. Reactions of beams, Determinateness. Connected bodies. Two force and three force members. Trusses, Method of joints. Method of sections. Determinateness of truss. Rigid and non-rigid frames. Simple mechanisms. Space frames.	15	25	1,2,3,4,5,	CO1 CO2	PSO 4 1	SD,EMP	G	ES
2	**StaticsCenter of Gravity, Moment of Inertia and Friction**: Centre of gravity. Centroids of lines and of basic and	15	25	1,2,4	CO3, CO8	PSO 4 1			

	composite areas, Built-up sections, Product of inertias. Mass moment of inertia, Types of friction. Characteristics of dry friction. Equilibrium on rough inclined plane. The wedge-The screw-The screw Jack-general bearing, Axle friction, Thrust bearing-Disc friction-Clutches.								
3	**Statics: Transmission of power** Lifting Machine, Basic machines, The differential principle, Linearlaw, Belt drive, Velocity ratio. Compound belt drive-length of belt. Transmission of power, Gearings, Trains of wheels. Epicyclic gearing. Speed reduction gear. Differential types of gear.	15	25	2,3,4,5	CO4,CO5	PSO 4 1			
4	**Dynamics: Strength and Elasticity of Materials** Review of kinematics of a particle. Force, mass and acceleration, Rectilinear and curvilinear motion. D'Alembert's principle, work, power and energy, Impulse and momentum, Equations of motion. Translation. Fixed axis rotation. Problems Involving friction, Simple stresses and strains. Hook's law. Elastic limit. Ultimate stress. Factor of safety, Lateral strain. Poisson's ratio. Stress concentration idea. Temperature stress. Simple shear, Elastic moduli relations.	15	25	1,2,3,4,5	CO6, CO7	PSO 4 1			

Reference Books

1.	Applied Mechanics by S. B. Junnarkar and H. J. Shah, Charotar Pub.
2.	Engineering Mechanics byMerium and Kraige, John Wiley & Sons.
3.	Vector Mechanics by Beer and E. R. Johnstons, McGraw-Hill Book Co.

4.	Engineering Mechanics by Huges and Martin, E.L.B.S. and Macmillan.
5.	Engineering Mechanics by R. S. Kumar.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

S.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	~~**Core / Elective**~~ **/ Foundation** **APM1201L: Laboratory Practical & Graphics**	**Credits / Hours per week**	**03**
Semester	**II**	Year of Introduction: 2010 Year of Syllabus Revision: ----	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, Graphics, discussion and viva	**is common for all experiments**	

No.	**EXPERIMENT**	**Contact hours**	**%weightage**	**BT Level**	**CO**	**PSO**
1	LAW OF PARALLELOGRAM OF FORCES	3	6.66	2,3	CO1	PSO4 1
2	LAW OF POLYGON	2	4.44	2,3	CO1	PSO4 1
3	SIMPLE BEAM	2	4.44	2,3	CO2	PSO4 1
4	JIB CRANE	2	4.44	2,3	CO2	PSO4 1
5	THEORY OF LIFTING MACHINE	3	6.66	2	CO4	PSO4 1
6	ROPE AND PULLEY BLOCK	2	4.44	2,3	CO4	PSO4 1
7	SCREW JACK	2	4.44	2,3	CO4	PSO4 1
8	DIFFERINTIAL AXLE	2	4.44	2,3	CO4	PSO4 1
9	WORM AND WORM WHEEL	2	4.44	2,3	CO5	PSO4 1
10	MOMENT OF INERTIA OF FLY WHEEL	2	4.44	2,3	CO3	PSO4 1
11	RADIUS OF GYRATION OF COMPOUND PENDULUM	2	4.44	2,3	CO3	PSO4 1

GRAPHICS						
12	COPLANAR CONCURRENT FORCE SYSTEM-1	3	6.66	2	CO1	PSO4 1
13	COPLANAR CONCURRENT FORCE SYSTEM-2	2	4.44	2	CO1	PSO4 1
14	COPLANAR NON-CONCURRENT FORCE SYSTEM-1	2	4.44	2	CO1	PSO4 1
15	COPLANAR NON-CONCURRENT FORCE SYSTEM-2	2	4.44	2	CO1	PSO4 1
16	REACTION OF BEAMS-1	2	4.44	2	CO2	PSO4 1
17	REACTION OF BEAMS-2	2	4.44	2	CO2	PSO4 1
18	ANALYSIS OF ROOF TRUSS FOR SIMPLY SUPPORTED	2	4.44	2	CO1	PSO4 1
19	ANALYSIS OF ROOF TRUSS FOR CANTILEVER	2	4.44	2	CO1	PSO4 1
20	WEDGE BLOCK FRICTION	2	4.44	2	CO8	PSO4 1
21	CENTROID OF PLANE LAMINA	2	4.44	2	CO3	PSO4 1

Programme Name: <u>B E Civil & IWM</u>

Bloom's Taxonomy (BT Levels): 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

S.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective / Foundation~~** **CVL 1201: BUILDING PLANNING AND DRAWING**	**Credits / Hours per week**	**3L+ 1T**
Semester	**II**	Year of Introduction: **2019** Year of Syllabus Revision: 2018	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures, Tutorials and Drawing		

Course Outcome (CO) CVL 1201

CO1 Primary knowledge of the locality in which the work is to be carried out, drawings are drawn and discuss before final design is made.
CO2 Student becomes acquainted with building planning and their development controls, skill of preparing drawings.
CO3 Learning principles of planning and architecture for buildings.
CO4 Drawing various types of views, the development controls covered by building bye laws and national building code for buildings.
CO5 Acquainted with AutoCAD.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/ Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Introduction to the subject of building drawing; Standard, Conventional signs. Abbreviations. Architectural symbols; ISI, Nomenclature: Size of scale. Standard method of dimensions; Significance of human and other natural factors and its effect on buildings and planning and relation to drawing; Introduction of municipal bye-laws and I.S.Codes provisions w.r.t. subject.	04	8%	1,2,3	CO1 CO2	PSO2	**(Emp), (Ent), (SD)**	**(L), (N),(R), (G)**	**(ES), (PE)**
2	Introduction of municipal by-laws: Development	06	12%	2,3,4		PSO2			

	Control Regulation (DCR) guideline includes Site plan, Layout, key plan, Floor Space Index, Building height, margins, Permissible built up area, set back, etc.				CO2				
3	Load bearing and frame structures. Staircase, Design of Dog legged staircase. Standard furniture: Standard fixtures and appliances for building.	04	8%	2	CO2	PSO2			
4	Introduction to basic principles of planning, orientation, aspect, prospect, furniture requirements, roominess, grouping, circulation, privacy, climate, economy, sanitation considerations etc.	06	12%	2,3	CO3	PSO2			
5	Drawing of building plan: Layout design, Modular Co-ordination. Introduction to principles of drawing plan, section at various level and furniture layout.	10	18%	6	CO4	PSO3			
6	Preparation of drawing based on plan: Complete drawing along with site plan. Elevation, detailed enlarged section at particular location like w.c. sinks, kitchen platform wash-basin, staircase etc, Complete drawing set.	06	12%	6	CO4	PSO3			
7	Perspective drawing, Necessity of perspective drawing, Classification of perspective drawing, Station point, Vanishing points, Cone of vision, Measure line, Picture plane, Horizon, Ground level, Exercise of two point perspective of various objects and small buildings.	08	15%	6	CO4	PSO3			
8	CAD, Introduction to software, Different command and their function, Draw menu and their basic command, Modify menu and their basic command. Practice of drawing sheet on CAD.	08	15%	2,3	CO4	PSO4			

REFERENCES

1.	Building drawing and detailing :Dr.Balgopal, T.S. Prabhu and Dr.K.VincentPoul,
2.	Building planning and services (part-I) A.D.Joshi, Mrs. M.A.Joshi Publishers.
3.	Civil Engineering drawing – R.J.Malik, G.S.Med, New Asian Pub. Delhi-6.
4.	Planning and designing buildings – Y.S.Sane,
5.	Building Drawing – M.G. Shah, C.M.Kale and S.Y.Patki
6.	National building code- I.S.Publisher
7.	Indian Standard 962 and 2332 I.S.Publisher.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

S.S OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective / Foundation~~** **CVL 1201L: BUILDING PLANNING AND DRAWING**	**Credits / Hours per week**	**03**
Semester	**II**	Year of Introduction: **2019** Year of Syllabus Revision: 2018	**Maximum Marks / Grade**	**50**
Mode of Transaction		Drawing, Term work and viva	**PSO1, PSO2 is common for all Drawings**	

Course Outcome (CO) CVL 1201

CO1 Primary knowledge of the locality in which the work is to be carried out, drawings are drawn and discuss before final design is made.
CO2 Student becomes acquainted with building planning and their development controls, skill of preparing drawings.
CO3 Learning principles of planning and architecture for buildings.
CO4 Drawing various types of views, the development controls covered by building bye laws and national building code for buildings.
CO5 Acquainted with AutoCAD.

No.	Drawing, Term work	Contact Hours	Course Code	BT Level	CO	PSO
1	Two Drawing-sheets of residential building (15 hours)	15	CVL1201L	1,2,3	CO2 CO3 CO4	PSO2, PSO3
2	Measured Drawing with CAD (09 hours)	10	CVL1201L	2,3,4	CO3 CO4	PSO2, PSO3
3	Planning and Design of Residential building (09 hours)	10	CVL1201L	2,3,4,5,6	CO1 CO2 CO3 CO4	PSO2, PSO3
4	Design of furniture arrangement in building component (03 hours)	4	CVL1201L	2,3,4,5,6	CO3	PSO2, PSO3

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B E (Civil Engineering) Regular Programme

Programme Outcomes(POs)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

S.S. OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core** **MEC :1202 Fundamentals of Mechanical Engineering**	**Credits / Hours per week**	**Lectures: 04** **Practical-: Nill**
Semester	**II**	Year of Introduction: Year of Syllabus Revision: 2018	**Maximum Marks / Grade**	**Theory: 100**
Mode of Transaction: Lectures				

Course Outcome (CO) MEC 1202

Co 1 Study and understand of steam boilers and application.

Co2 Understand internal combustion engine with efficiency ratio.

Co3 Understand refrigeration system and air compressor system with its principal and application.

Co4 Study different power transmission drive.

Co5 Understand fabrication process with application of different methods .

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PO**	**Elements of** Employability (Emp)/ Entrepreneurship	**Relevance to** Local (L)/ National (N)/ Regional(	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and

							(Ent)/ Skill Developme nt (SD)	R)/Global (G)	Professional Ethics (PE)
1	Properties of steam, steam boilers-classification and constructional details, steam engines, determination of HP, BHP, FHP and mechanical and thermal efficiencies, illustrated problems.	8	15	2	Co1	PO1	All	All	All
2	classification of I.C.Engines, Otto, Diesel and dual combustion engines, 2-stroke and 4-stroke engines, IHP, BHP, mechanical and thermal efficiencies, illustrated problems	8	15	1,2	Co2	PO1			
3	Air compressors-types and uses	8	15	3	Co3	PO1			
4	Elementary idea of refrigeration and air-conditioning principles.	8	15	4	Co3	PO1			
5	Transmission power-types of drives, group and individual drivers- their merits and demerits	8	20	2,5	Co4	PO1			
6	Elementary idea about workshop processes and tools-simple sand moulding, soldering, welding, brazing, riveting, punching, drilling and tools connected with each process.	12	20	3	Co5	PO1			
		52	**100**						

Reference Books

1.	Elements of Workshop ;Hazara chaudhary ;Asia Publishing House
2.	Heat engine Shah & Pandya; Charotar Publishing House
3.	Theory of Machines R.S.Khurmi and J.K.Gupta S.Chand

Bloom's Taxonomy Levels 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E (Civil)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**		**Academic Year**	**2019-20**
S.S. OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)			
Year	**I**	~~**Core**~~ **/ Elective /** ~~**Foundation**~~ **CVL 1206: Surveying-I**	**Credits / Hours per week**	**3L + 1T**
Semester	**II**	Year of Introduction: 2019-20 Year of Syllabus Revision:	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) CVL 1202

CO1 Understand and learn basic surveying.
CO2 Understand and learn survey methods using different instruments.
CO3 Under stand and learn various methods of computation of area and volumes.
CO4 Understand, learn and operating of surveying instruments.
CO5 Understand and learn hydrography.
CO6 Understanding and learning applications of surveying related theories .
CO7 Understanding and learning field survey.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance** Local (L)/ /National (N)/ Regional(R)/ Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Different methods of leveling: LS and CS, Contouring; sources of error;	08	15	2,3	1,2,4, 6	PSO2, PSO4	Employability (Emp)/	Global (G)	PE

	curvature and refraction correction.						Entrepreneurship (Ent)/ Skill Development (SD)		
2	Plane table and accessories: Adjustments, Different plotting methods, errors in plane table survey, two point and three point problem.	04	07	2,3	1,2,4, 6	PSO2, PSO4			
3	Computation of areas and volumes : Boundary area, trapezoidal and Simpsons rule, Planimeter; Area by coordinates and LMD volume computation by LS,CS, Contour maps and spot levels.	10	19	2,3,4	2,3,6	PSO2, PSO4			
4	Study of Transit and optical Theodolite; Adjustment; Transit survey; Latitude and departure; Gale"s Traverse table; Numerical based on above.	08	15	2,3,4	2,3,6	PSO2, PSO4			
5	Tacheometry: Principle; Determination of constants; computation of distance and levels; Inclined sights; and Tangential tacheometry.	09	17	2,3,4	2,3,6	PSO2, PSO4			

6	Total station: Introduction, Components used in Total station, Types of Total station survey , Advantages and Disadvantages of Total station surveying.	06	12	2, 3,4	2,3,6	PSO2, PSO4	Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Global (G)	
7	Hydrography: Introduction, Purposes, Control points, Sounding, Instruments & methods of locating soundings.	05	09	2,3	5	PSO2			
8	Setting out works: Building , Culvert, Bridge, Tunnel	05	09	2,3	7	PSO2, PSO4			

Reference books

1.	Surveying and levelling- vol.I & II, Kanitkar and Kulkarni, Published by A.V.G. Prakashan, Pune-2
2.	Surveying: - Vol.-I & II Dr. B.C.Punmia, Pub: Laxmi Publisher,New Delhi
3.	Elementary Surveying : - S.K.Mahajan , pub: Dhanpatrai and sons, New Delhi.
4.	Surveying : - Vol: I, Dr. K.R.Arrora,Standard Book House, Delhi-6.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

S.S. OF B.E.-I (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective~~ / ~~Foundation~~** **CVL 1206L: Surveying-I Practical**	**Credits / Hours per week**	**03**
Semester	**II**	Year of Introduction: 2019-20 Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**
Mode of Transaction		Termwork		

No.	**Practical**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Theodolite introduction	CVL 1202L	1,2,3	CO4	PSO2
2	Measurement of angles	CVL 1202L	2,3,4	CO4	PSO2
3	Lineout of building by manual method	CVL 1202L	2,3,4	CO1, CO7	PSO2
4	Lineout of building by Instrument(Theodolite)	CVL 1202L	2,3,4	CO1, CO7	PSO2
5	Road Profile survey	CVL 1202L	2,3,4	CO1, CO7	PSO2
6	Road profile sheet preparation	CVL 1202L	2,3,4	CO2, CO7	PSO2
7	Digital planimeter	CVL 1202L	3,4	CO7	PSO2
8	Introduction Total station	CVL 1202L	3,4,5	CO1	PSO2
9	Station set up, Angle measurement, Height measurement with Total station, Traverse survey with Total station	CVL 1202L	3,4,5	CO1, CO7	PSO2

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Program Name: Bachelor of Civil Engineering

Programme Specific Outcomes (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

F.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **AMT1303:Applied Mathematics-III**	**Credits / Hours per week**	**04**
Semester	**I**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) AMT1303

CO1 Understands the concept of different types of line integrals with evaluation techniques.

CO2 Understands the Double,Triple integrations and can apply it appropriately, to evaluate Volume, Mass, Area, C.G. and M.I.

CO3 Through various integral theorems, understands the relationships between various kinds of multiple multiple integrals,line integral and apply these concepts in solving engineering problems related to area, mass volume, flow problems, work done etc.

CO4 Able to analysis, classify and interpret data to answer questions about the real world problem, and able to demonstrate the ability to analyze data by appropriately fitting, assessing, and interpreting a variety of statistical models.

CO5 Understands the basic probability theories well and implement it to probability models with application to the areas related to Civil sector, and demonstrates a proficiency in collection, organization, design, and drawing inferences from data using appropriate statistical methodology and problem solving skill.

CO6 Make use of Fourier series to analyze wave forms of periodic functions and use it for solving/modeling systems in Civil engineering.

CO7 Introduce students to partial differential equations and explain to solve linear partial differential equations of first order.

CO8 Classify partial differential equations and extract information from partial derivative models in order to interpret reality.

CO9 Explain the technique of separation of variables to solve PDEs and analyze the behavior of solutions.

CO10 Acquire the skills to evaluate complicated real variable function properties in the light of complex variable theory

CO11 Learn the mapping properties of elementary functions and understandrelations between conformal mappings and geometricstructures.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Multiple Integrals:** Reorientation of concept of integrals, line integrals, double and triple integrals-evaluation techniques, change of order of integration, Integrals in polar and cylindrical coordinates- transformation of multiple integrals, application of double and triple integrals for evaluation of Area, Volume and Mass	8	17	1,2,3	CO1 CO2	PSO1	SD	G	PE
2	**Vector Calculus:** Surface integrals, Green's theorem	6	12.5	1,2,3	CO3	PSO1			

	Stoke's theorem, Gauss divergence theorem, applications of integral theorem.								
3	**Statistics and Probability:** Correlation analysis, Regression analysis and Curve fitting. Probability distributions (Binomial, Poisson and Normal) Confidence intervals and testing of hypothesis.	10	21	2,3,4,6	CO4 CO5	PSO1			
4	**Fourier Series:** Fourier expansion of periodic functions with period 2 π, Fourier series of even and odd functions. Half range series, Fourier series of functions with arbitrary period, conditionsof convergence of Fourier series.	6	12.5	1, 2, 3, 5	CO6	PSO1			
5	**Second order partial differential equations:** Classification into elliptic, Parabolic and hyperbolic equations, models leading to 2nd order PDEs, Boundary value problems involving 2nd order PDEs and their solution by methods of separation ofVariables. Heat, wave and Laplace equations and their solution by the method of separation of variables andusing Fourier series.	8	17	2, 3, 4, 5	CO7, CO8, CO9	PSO1			
6	**Functions of Complex Variables:** Limit, continuity and derivative of functions of a complex	5	10	2,3,4	CO10	PSO1			

	variable. Analytic functions and their applications: Harmonic, conjugate harmonic and potential functions.								
7	**Transformations and Conformal Mappings:** Linear transformations of complex domains, some special transformations: Bilinear transformations, Transformation by some standard functions, Conformal mapping, applications of transformations and conformal mappings.	5	10	2,3,4,5	CO11	PSO1			

Reference Books:

1.	**Erwin Kreyszig, Advanced Engineering Mathematics, (6th edition) John-Wiley &Sons.**
2.	**Donald Greenspan, Introduction to Partial Differential Equations, Mc. Graw – Hill Inc.**
3.	**C.R.Wylie, Advanced Engineering Mathematics, Mc. Graw– Hill, Inc.**

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

F.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **AMT 1303L : Applied Mathematics – III**	**Credits / Hours per week**	**02**
Semester	**I**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**
Mode of Transaction		Term Work, Practical and Viva		

Course Outcome (CO)

CO1 Understands and be able to apply Mathematical software towards the problem solving.

CO2 Able to analyze, classify and interpret data using computer algorithms.

CO3 Able to demonstrate the ability to analyze data by appropriately fitting, assessing, and interpreting a variety of statistical tools.

CO4Able to apply the appropriate software programs towards the basic probability theories with application to the areas related to civil sector.

CO5Understands and implement the appropriate software programs related to data description, statistical inference.

No.	Programs		Course	BT	CO	PSO

			Code	Level		
1	Introduction to Mathematical Software. (Octave / Python)		AMT1303L	2	CO1, CO2	PSO1
2	Basic inbuilt commands and functions of vectors in Mathematical Software.			2,3	CO1, CO2	
3	Basic inbuilt commands and functions of matrices in Mathematical Software.			2,3	CO1, CO2	
4	a. Basic command for 2D – plotting using Mathematical Software. b. Presentation of frequency distribution into graphs using Mathematical Software. (Histogram, bar, pie, etc.)			2,3	CO1, CO2	
5	Measure of central Tendency (1) Mean (2) Median (3) Mode			2,3,4	CO1, CO2	
6	(a) Measure of Dispersion: Standard Deviation and Variance (b) Relative Measure: Coefficient of variation			2,3,4	CO1, CO2	
7	Correlation Analysis			2,3,4	CO1, CO2, CO3	
8	Rank Correlation Analysis			2,3,4	CO1, CO2, CO3	
9	Regression Analysis (1) Regression line y on x (2) Regression line x on y			2,3,4	CO1, CO2, CO3	
10	Curve fitting (1) Straight line($y = a + bx$ or $y = ax + b$)			2,3,4	CO1, CO2,	

	(2) Parabola (3) Exponential ($y = ae^{bx}$) (4) Power function($y = ab^{x}$and $y = ax^{b}$)				CO3	
11	Probability Distribution (1) Binomial Distribution (2) Poisson Distribution28 (3) Normal Distribution			2,3,4	CO1, CO4	
12	Hypothesis Testing			2,3,4	CO1, CO5	

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil) Regular Programme

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**		**Academic Year**	**2020-21**
F.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)			
Year	**II**	~~**Core / Elective**~~ **/ Foundation** **MATERIALS AND STRUCTURES** **(APM 1303)**	**Credits / Hours per week**	**04**
Semester	**I**	Year of Introduction: Year of Syllabus Revision: 2004	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) APM 1303

CO1: Understanding of shear force and bending moment in beams for different types of loading and support by graphical and analytical method.

CO2: Learning theory of simple bending in beam and its application in the bending stress analysis for simply supported, cantilever beams and flitched beams.

CO3: Student will learn basic theory of shear stress in beam and apply it to calculate shear stresses and its distribution.

CO4: Analysis of beam for calculating curvature, slope and deflection and application of this theory in the analysis of carriage springs.

CO5: Understanding compound stresses and calculation of principal stresses, strains and shear stress by analytical method and Mohr's circle.

CO6: Learning concept of resilience due to normal stresses and its application to find stresses due to of gradual, sudden and impact loading.

CO7: Learning stress analysis of thin cylinders and spheres subjected to internal pressure and its application in design of shells.

CO8: Understanding load transfer and failure in bolted joints and applying them in the analysis and design of bolted connections subjected to axial force.

CO9: Learning concept of combined direct and bending stresses in columns and applying it for analysis of retaining walls, chimney and dam for horizontal load.

CO10: Student will learn Buckling Analysis of column and strut by Euler's and Rankine's Formula and apply it in design.

CO11: Learning the theory of torsion of circular shafts and applying it in design of shaft used for power transmission and helical spring used for absorbing shock energy.									
Unit No.	**Topic/Unit**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G) development mental needs	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Shear force, Bending moment diagrams for Beams and beam stresses**: Diagram of bending moment and shearing force in cantilever and simply supported beams under static loads-analytically with varying, distributed loads and couples, Theory of simple bending: Distribution of normal stress due to bending, moment of resistance, Beam of uniform strength, Flitched beam, Built up section under bending. Distribution of shear stress. Curvature, slope and deflection of cantilever and simply supported beams including overhang beams, Carriage springs.	18	30	1,2,3,4, 5	CO1, CO2, CO3, CO4	PSO4	SD	G	ES
2	**Principal stresses and strains and thin shells** Ellipse and circle of stresses, Principal planes, Principal stresses and strains, Mohr's stress and strain circle for various applications of compound stress, Resilience of sudden, impact and shock loading, Stresses in thin cylinders subjected to internal pressure, Cylindrical shell with hemispherical ends, Spherical shell, Bolted joints, types of	18	30	2,3,4,5	CO5, CO6, CO7, CO8	PSO4			

	failure and load transfer in bolted joint, Design of bolted connections.								
3	**Columns subjected to axial and eccentric loading** Eccentric loading: Tension or compression combined with bending, Middle third rule, Wind pressure on walls and chimney, Water pressure on dam. Simple strut theory - Euler's and Rankine's Formula.	12	20	2,3,4,5	CO9, CO10	PSO4			
4	**Torsion of Circular shaft** Torsion of circular shafts of uniform sections. Torsional resilience. Distribution of torsional stress- Angle of twist, Power transmissions from shafts, Combined Bending and Torsion including theories of failure, Helical spring under axial force.	12	20	2,3,4,5	CO11	PSO4			

Reference Books

1.	Mechanics of Structures Vol. I by S.B. Junnarkar and H. J. Shah.
2.	Introduction to Mechanics of Solids by I.P. Kapila and S.N. Agnihotri.
3.	Elementary Strength of Materials by S. Timonshenko.
4.	Strength of Materials by Ramamrutham.
5.	Strength of Materials by R.C. Patel , T.D. Bhagia, & B.M. Patel.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

F.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**~~Core / Elective~~ / Foundation** **APM 1303 L: Laboratory Practical and Graphics statics drawing**	**Credits / Hours per week**	**04**
Semester	**I**	Year of Introduction: Year of Syllabus Revision: 2010	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, Graphics, Discussion and Viva	**is common for all experiments**	

No.	**EXPERIMENT**	**Contact Hours**	**% weightage**	**BT Level**	**CO**	**PSO**
1	COPMLETE TENSILE TEST ON MILD STEEL (MS)	3	5	2,3	CO5,6,7	PSO4
2	MODULUS OF ELASTICITY FOR MS	3	5	2,3	CO5,6,7	PSO4
3	DIRECT SHEAR TEST ON MS	3	5	2,3	CO3,5,7,8	PSO4
4	COPMRESSION TEST ON MS AND CAST IRON (CI)	3	5	2,3	CO3,5,10	PSO4
5	COMPRESSION TEST ON TIMBER	3	5	2,3	CO3,5,10	PSO4
6	IZOD IMPACT TEST ON CI, MS AND BRASS	3	5	2,3	CO6	PSO4
7	HARDNESS TEST ON MS, CI AND BRASS	3	5	2,3	CO1	PSO4
8	TORSION TEST ON MS AND CI	3	5	2,3	CO5,11	PSO4
9	MODULUS OF RUPTURE OF TIMBER	3	5	2,3	CO1,2	PSO4
10	MODULUS OF ELSTICITY OF TIMBER	3	5	2,3	CO4	PSO4

GRAPHICS

11	ANALYSIS OF FINK ROOF TRUSS	3	5	2,3,4	--	PSO4
12	ANALYSIS OF ROOF TRUSS FOR WIND LOAD	3	5	2,3,4	--	PSO4
13	SF AND BM DIAGRAM FOR SIMPLY SUPPORTED BEAM	3	5	2,3,4	CO1	PSO4
14	SF AND BM AND AF DIAGRAM FOR SIMPLY SUPPORTED BEAM	3	5	2,3,4	CO1	PSO4
15	SF AND BM DIAGRAMS FOR SIMPLE BEAMS WITH OVERHANG	3	5	2,3,4	CO1	PSO4
16	MOHR’S STRESS CIRCLE METHOD-1	3	5	2,3,4	CO5	PSO4
17	MOHR’S STRESS CIRCLE METHOD-2	3	5	2,3,4	CO5	PSO4
18	MOHR’S STRESS CIRCLE METHOD-3	3	5	2,3,4	CO5	PSO4
19	MOHR’S STRESS CIRCLE METHOD-4	3	5	2,3,4	CO5	PSO4
20	MOHR’S STRESS CIRCLE METHOD-5	3	5	2,3,4	CO5	PSO4

Programme Name: <u>B E Civil & IWM</u>

Bloom's Taxonomy (BT Levels): 1. Remember 2. Understand 3. Application 4.Analysis 5.Evaluation 6. Creation

Programme Specific Outcome(PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

F.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **CVL 1301: FLUID MECHANICS - I**	**Credits / Hours per week**	**5/ 3L+ 1T+ 2P**
Semester	**I**		**Maximum Marks / Grade**	**100+50=150**
Mode of Transaction		Lectures, Tutorials and Practical's		

Course Outcome (CO) CVL 1301FLUID MECHANICS - I

CO1 Students become aware about properties and behavior of fluids in static as well as moving conditions.
CO2 Students are able to do measurement of rate of flow and pressure.
CO3 Students are acknowledged to applications of fundamental laws of mechanics.
CO4 Students become able to derive new concept with special reference to incompressible fluids.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Introduction to Fluid Mechanics and its role in Engineering Fluids – definition and types. Fluid properties and types. Fluid properties and unit of measurements. Fluid pressure – hydrostatic pressure and distribution. Measurement of pressure – gauges and manometers.	08	16%	1,2,	1	2	SD	L/N/R/G	PE

2	Hydrostatic forces on submerged surface areas – plane and curved. Total pressure curved. Resultant pressure and center pressure and their computations.	03	6%	1,2,3	1,3	2			
3	Hydrostatic forces on closed surfaces – Buoyance – stability of floating and submerged bodies, metacentre and its determination. Relative equilibrium – motion with linear uniform acceleration and uniform rotation.	04	8%	1,2,3	1,3	2			
4	Fluid flow - Continuum concept. Fluid particle and flow description. Types and classes of flow. Kinematics of flow – flow velocity. Description of flow field-streamlines, path line, streamline; streamline flow patter-steam function. Flow acceleration. Translation, rotation and deformation of fluid element. Circulation. Vorticity. Ir-rotational flow – velocity potential function, flow net. Equation of continuity.	08	16%	1,2,4	1,3	2			
5	Dynamics of flow: Fluid forces stress and strain. Equations of motion. Euler's equation. Bernoulli's theorem and its modifications and applications. Kinetic energy correction factor. Cavitation phenomena. Vertex flow free and forced.	14	27%	1,2,3	1,3	2			
6	Fluid flow (incompressible) through closed conduits : Laminar & turbulent flow – Reynold's Experiment, Resistance to flow –Froude's Experiment Laminar flow through pipes and between parallel plates, velocity distribution and loss of head. Turbulent flow through pipes. Friction factor for smooth and rough pipes. Moody's diagram and it's use.	05	11%	2,3,4	4	3			
7	Minor loss of head in flow through pipe at expansion,	04	8%	2,3,4	4	3			

	etc. energy gradient and Hydraulic gradient – siphon pipe flow through uniform pipe between two – reservoirs. Compass pipe-equivalent length. Pipes in parallel. Branching pipes. Pipe line with laterals. Power transmission by pipes.								
8	Flow measurements - Flow through orifices and mouth piece various types – coefficient of discharge and velocity. Flow notch / weir – rectangular triangular, cippoletti. Pipe flow measurements –Venturimeter, orifice meter, nozzlemeter, elbow meter, rotameter, pitot tube.	04	8%	2,3,4	2	2			
T.W./ Pr.	Termwork / Practicals shall be based on above syllabus.								

REFERENCES

1.	Dave R.M., Fluid Mechanics Part I
2.	Jain A.K., Fluid Mechanics
3.	Mody P.N. &Sheth S.M., Hydraulics & Fluid Mechanics, Standard Book House.
4.	Ramamritham S., Hydraulics, Fluid Mechanics and fluid machines, DhanpatRai Publishing Company, New Delhi.
5.	Bansal R.K., Fluid Mechanics and Hydraulic Machines, Laxmi Publications.
6.	Vallentine H.R., Applied Hydrodynamics
7.	Streeter V.L., Fluid Machine
8.	Garde R.J. &Mirajgaokar A.J., Engineering Fluid,
9.	Garde R.J., Fluid Mechanics through Problems, New Age International Publishers.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

F.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **CVL 1301L Fluid Mechanics – I Practical / Termwork including Viva**	**Credits / Hours per week**	**02P**
Semester	**I**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**

Course Outcome (CO) CVL 1301L

CO1 Students become aware about properties and behavior of fluids in static as well as moving conditions.
CO2 Students are able to do measurement of rate of flow and pressure.
CO3 Students are acknowledged to applications of fundamental laws of mechanics.
CO4 Students become able to derive new concept with special reference to incompressible fluids.

Mode of Transaction	Field Practical's, discussion and viva	**PSO1 is common for all experiments**

No.	Term-work / Field Practical shall be based on above syllabus	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	VERIFICATION OF LAW OF HYDROSTATIC PRESSURE	02 hours	CVL	2,3,4,5	CO2 , CO3	PSO2
2	DETERMINATION OF THE COIFFICIENT FOR A CIRCULAR ORIFICE	4 hours	CVL	2,3,4,5	CO2 , CO3	PSO2
3	CALIBRATION OF A "V" NOTCH	4 hours	CVL	2,3,4,5	CO2 , CO3	PSO2
4	EXPERIMENTAL PROOF OF BRMOULLI's THEOREM	04 hours	CVL	2,3,4,5	CO2 , CO3	PSO2
5	CALIBRATION OF VENTURIMETER	04 hours	CVL	2,3,4,5	CO2 , CO3	PSO2
6	VERIFICATION OF REYNOLD'S NUMBER FOR LAMINAR-TURBULANT FLOW	04 hours	CVL	2,3,4,5	CO2 , CO3	PSO2
7	VERIFICATION OF RELATIONSHIP BETWEEN ENERGY LOSS & VELOCITY AND DETERMINATION OF FRICTION FACTOR FOR A PIPE	04 hours	CVL	2,3,4,5	CO2 , CO3	PSO2

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E (Civil and IWM)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

F.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **CVL 1302: Building Planning and Design**	**Credits / Hours per week**	**03 hours/week**
Semester	**I**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) CVL 1302

CO1 Understand the principles of planning for public building planning
CO2 Design the plan, elevation and section for various types of public building
CO3 Understand and learn the effects, objectives and principles of town planning
CO4 Design of sun-shading devices for various buildings
CO5 Classify the types of sun-shading devices and their application
CO6 Learn the various Acts in building planning
CO7 Understand types of buildings
CO8 Learn principles of composition for buildings

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professio

									nal Ethics (PE)
1	Preliminary Introduction to Historical review of classical styles of Building Ancient Building, Modern Building	3	7	2	7	PSO2	Emp	N	HV
2	Principles of Town Planning :- Urban development plan-Regional plan History and Growth of Indian towns Developments of sub-urban,satellite town etc. Town planning for Hot climate. Provision of Road Layout -City layout-Green Belt.	5	13	2	3	PSO2	Emp	N	HV
3	Town planning and Building Planning Acts Gujarat Town Planning Act. Factory Act, Land Aquisition act. etc.	5	13	2	3,6	PSO2	Emp	N	HV
4	Design of Public Buildings, Consideration in planning of schools, Colleges & Libraries, Consideration in planning of Hospitals, Hotels, Consideration in planning of Cinema Theatres, office buildings, Consideration in planning of markets, High rise Buildings etc.	7	14	3,4,6	2	PSO3	Ent	N	ES
5	Design of Road side Amenities, Swimming pools,Bus Terminals etc. , Special considerations in planning of low cost Houses, Pre-fabricated Houses. Slum improvement proposals.	5	13	3,4,6	2	PSO3	SD	N	ES
6	Principles of composition for 2-D plans- Repetitions, Contrast,Emphasis, Transition, Balance Axial Arrangement.	5	13	2	8	PSO2	Emp	N	ES
7	Land scaping and home gardening, Selection of Building site for various occupation, Day lighting, Artificial lighting, Elementary water supply and drainage and colour scheme.	5	13	2	7	PSO4	SD	N	ES
8	Design of sun shading system, Overhang, louvers, Solar data, Application of solar data to design louver system	7	14	3,4,5	4,5	PSO3, PSO4	Ent	N	ES
Reference Books									

1. Building drawing and detailing : Dr. Balgonal, T.S.Prabhu Dr. K. Vinanat Paul, Spader, KDFA Building, Calicut.
2. Building Planning and Services : A. D. Joshi, Mrs. M. A. Desai Pub. (Part-I)
3. Civil Engg. Drawing : R.J.Malik, G.S.Med, New Asia Pub. Delhi-6
4. Planning & Desigining Building : Y.S.Sane, Allies Book Store, Pune –4 & Engg. Book Pub. Co. Pune-16
5. Working drawing – Keith Stypes
6. Graphic details for architects – Carl Kemmerkh
7. Generall Architectural Drafting – W.E.Wyatt
8. Practical perspective drawing – P.J.Lawson
9. Manual of Graphic techniques – Tom Porter
10. National Building code – I.S.Publisher
11. Indian Standard 962 – 2332 – I.S.Publisher

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

F.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **CVL1302L : Building , Planning and Design : Termwork**	**Credits / Hours per week**	**03**
Semester	**I**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**
Mode of Transaction		Termwork		

No.	**Termwork**	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Principles of composition for 2D plans and 3D volumes	6	CVL 1302L	1,2	CO8	PSO2
2	Principles of composition for 3D volumes	6	CVL 1302L	1,2	CO8	PSO2, PSO4
3	Design of Sunshades	6	CVL 1302L	3,4,6	CO4	PSO2, PSO3
4	Layout of Public Buildings	6	CVL 1302L	2	CO1	PSO2
5	Design of Public Buildings	9	CVL 1302L	3,4,6	CO1	PSO2, PSO3
6	Planning criteria and design of public buildings	3	CVL 1302L	2,3	CO2	PSO2, PSO3
7	Application of Principles of composition for buildings	3	CVL 1302L	2,3	CO7, CO8	PSO3,PSO4

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Program Name: Bachelor of Civil Engineering

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

F.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **FUNDAMENTAL OF ELECTRICAL ENGINEERING (ELE1301)**	**Credits / Hours per week**	**04**
Semester	**I**	Year of Introduction**:** Year of Syllabus Revision:	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) ELE 1301

CO1 **Determine** the parameters of DC and AC circuits. BT 5

CO2 **Evaluate** the performance of AC circuits. BT 5

CO3 **Explain** performance characteristics of DC Rotating Machines, AC Rotating machines and Transformers. BT 5

CO4 **Determine** the parameters of DC Rotating Machines. BT 5

CO5 **Explain** fundamentals concepts of Semiconductor Theory. BT 2

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics

									(PE)
1	**DC circuits:** Review of Ohm's law. Kirchhoff's laws. Series and parallel circuits. Star –Delta transformation. Their application in solution of simple d.c.circuits.	8 hrs	17%	5	CO1	PSO1	SD	G	PE
2	**AC circuits:** Sinusoidal e.m.f. and currents. R.M.S. and average value. Phasor representation. Voltage- current relation in purely resistive and capacitive circuits and their series combination. Power and power factor.	8 hrs.	17%	5	CO1 CO2	PSO1			
3	**POLYPHASE SYSTEM:** Relation between phase and line voltage and currents of star and delta connections. Power balance in a 3 phase circuits. Measurement of power in a 3 phase system.	6 hrs.	12%	5	CO1 CO2	PSO1			
4	**D. C. GENERATORS:** Principle of working. Types of generators. Their characteristics and applications	6hrs	10%	5	CO3 CO4	PSO1			
5	**D. C. MOTORS**: Principle of working. Types of motors. Their characteristics and applications. Speed Control	6hrs	10%	5	CO3 CO4	PSO1			
6	**TRANSFORMER:** Review of Faraday's law and Lenz's law. Self and mutual induction. Principle and Types of transformers. E.M.F. equation. Transformation ratio. Transformer on no load and on load conditions. Vector diagram. Equivalent circuit. Losses and efficiency: All day efficiency O.C. and S.C. and test on transformer. Auto transformer, 3-phase transformer connections. Applications	6 hrs.	8%	5	CO3	PSO1			
7	**INDUCTION MOTOR:** Principle of working and application	4 hrs.	8%	5	CO3	PSO1			
8	**Alternators :** Principle of working and applications. **Syn. Motor :** Principle of working. Special features and its applications	4 hrs.	8%	5	CO3	PSO1			
9	**QUALITATIVE SEMICONDUCTORS THEORY:** Conductors. Semiconductors. Insulators. Intrinsic and Extrinsic Semiconductors. Conduction in PN, PNP and NPN Junctions. Their Characteristics. Zener diode. Photo diode and Display devices.	4 hrs.	8%	2	CO5	PSO1			

Reference Books

1	Basic Electrical Engineering by V.N. Mittle
2	Electrical technology by B.L. Theraja
3	Problem in Electrical Engg by Parker Smith

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

F.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **FUNDAMENTAL OF ELECTRICAL ENGINEERING (ELE1301L)**	**Credits / Hours per week**	**02**
Semester	**I**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**

Course Outcome (CO) ELE

CO1 **Utilize** measuring devices, apparatus and equipment effectively.

CO2 **Demonstrate** various network theorems and 3-phase power measurement by two wattmeter method.

CO3 **Analyse** various circuit configurations.

CO4 **Develop** a technical report with related observations, calculations, results and inferences effectively.

CO5 **Verify** various performance characteristics of d.c machines

CO6 **Evaluate** performance parameters of 1-phase transformer

Mode of Transaction	Practical's, discussion and viva	**PSO1 is common for all experiments**

No.	Experiment	Contact Hours	Course Code	BT Level	CO	PSO
1	Study of Laboratory apparatus.	2	ELE 1301 L	3	CO1	PSO1
2	Study of DC machines.	2	ELE 1301 L	3	CO1	PSO1
3	Verification of Kirchhoff's laws.	2	ELE 1301 L	2, 3	CO1, CO2, CO4	PSO1
4	R- L Series circuit.	2	ELE 1301 L	3,4	CO1, CO3, CO4	PSO1
5	Power Measurement in a single phase circuit by 3 Voltmeter method.	2	ELE 1301 L	3,4	CO1, CO3, CO4	PSO1

6	Open circuit and short circuit test on single phase Transformer.	2	ELE 1301 L	3,5	CO4, CO6	PSO1
7	To plot the characteristics of D.C. Series Generator.	2	ELE 1301 L	3,4	CO4, CO5	PSO1
8	To plot the characteristics of D.C. Shunt Generator.	2	ELE 1301 L	3,4	CO4, CO5	PSO1
9	To plot the characteristics of D.C. Compound Generator.	2	ELE 1301 L	3,4	CO4, CO5	PSO1
10	Speed control of D.C. Shunt motor.	2	ELE 1301 L	3,4	CO4, CO5	PSO1
11	Power measurement in a three phase circuit by Two wattmeter method.	2	ELE 1301 L	2,3	CO2, CO4	PSO1

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyze and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

S.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **APM 14XX: NUMERICAL METHODS AND COMPUTER APPLICATIONS**	**Credits / Hours per week**	**04**
Semester	**II**	Year of Introduction: 2020-21 Year of Syllabus Revision:	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) APM1406

CO1 Studying Salient features of Microsoft Excel and its application in civil engineering.
CO2 Basic knowledge of computer hardware and information technology.
CO3 Explanation of the fundamentals of computer programs, flow charting etc.
CO4 Preparing computer programs for solving general and civil engineering problems.
CO5 Develop programs for decision making and repetitive calculations.
CO6 Prepare Programs based on 1D and 2D arrays.
CO7 Solution of Initial value problems by numerical methods.
CO8 Getting knowledge of numerical methods to solve algebraic and transcendental equations.
CO9 Learning numerical methods for differentiation and integration.

Unit No.	**Topic/Unit**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship(	**Relevance to** Local (L)/ National (N)/ Regional	**Relation to** Gender (G), Environment and Sustainability (ES), Human

							Ent)/ Skill Develop ment (SD)	(R)/Glob al (G) develop mental needs	Values (HV)and Professional Ethics (PE)
1	**Elements of programming:** Languages of Computer and Flowcharting, Constants and variables. Formatted/unformatted Input/output Statements, Structured programming. Decision and loop Control Statements. Subscripted variables and implied looping.	25	40%	2, 3, 6	CO3 CO4 CO5 CO6	PSO2 ,4	SD	G	
2	**Study of Spreadsheets:** Introduction to spreadsheet package and its Applications in Civil Engineering.	05	10%	1,2	CO1	PSO2 ,4			
3	**Drafting:** Introduction to drafting package and it's applications in 2D and 3D.Introduction to Building information modeling.	05	10%	1,2	CO2	PSO2 ,4			
4	**Numerical Methods:** Initial value problems and methods of solutions such as Picard method, Euler's method and Runga-Kutta method, Numerical Integration and Differentiation. Finding roots of algebraic and transcendental equations. False position method. Structural engineering application of all above methods.	25	40%	2, 3, 4, 5	CO7 CO8 CO9	PSO2 ,4			

Reference Books

1.	Fundamentals of Computers – Rajaraman V., 3rd Edition, Prentice Hall of India, New Delhi, 1999.
2.	The C Programming Language – Ritchie, D. M. and Kernighan B. W., 2nd Edition, Prentice Hall of India Pvt Ltd, 2008.
3.	Computer Oriented Numerical Methods – Rajaraman V., Prentice-Hall India.

4.	An Introduction to Excel for Civil Engineers: From Engineering Theory to Excel Practice - GuntharPangaribuan

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

S.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **APM 14XXL: NUMERICAL METHODS AND COMPUTER APPLICATIONS**	**Credits / Hours per week**	**02**
Semester	**II**	Year of Introduction: 2020-21 Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**
Mode of Transaction		Tutorials		

No.	**Tutorials**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**
1	Matrices and Determinants	02	05	1,5	CO2	PSO2,4
2	Introduction to Computer and MS Excel	02	05	1,2,3	CO1	PSO2,4
3	Introduction to C-programming	02	10	1,2,3	CO3	PSO2,4
4	Simple C programs	04	15	3,6	CO4	PSO2,4
5	C- programs with control Statements	04	15	3,6	CO5	PSO2,4
6	C- programs using Arrays	04	10	3,6	CO6	PSO2,4
7	Initial value Problem-1	03	10	2,5	CO7	PSO2,4
8	Initial value Problem-2	03	10	2,5	CO7	PSO2,4
9	Roots of Non-Linear Equation	03	10	4	CO8	PSO2,4
10	Numerical Integration	03	10	4	CO9	PSO2,4

Programme Name: <u>B E Civil & IWM</u>

Bloom's Taxonomy (BT Levels): 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Specific Outcome(PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyse and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

S.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **CVL 1401: FLUID MECHANICS - II**	**Credits / Hours per week**	**3L+ 1T**
Semester	**II**	Year of Introduction: Year of Syllabus Revision: 2018	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures, Tutorials		

Course Outcome (CO) CVL 1401FLUID MECHANICS - II

CO1 Students are made aware about gravity flow (open channel flow)
CO2 Students are made aware about complex flow conditions like gradually and spatially varied flow
CO3 Students are made aware about concept of flow around solid boundaries
CO4 Students are made aware about analysis of complex flow phenomena by Model studies.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Flow around submerged bodies and boundary layer theory : Forces due to fluid flow-viscous drag, pressure drag and lift, Boundary layer theory Laminar and Turbulent Boundary layer Boundary layer, Thickness, Displacement thickness, momentum thickness.	07	13.5 %	1,2,3	3	2	SD	L/N/R/G	PE

	Boundary layer equation. Momentum equation for laminar Boundary layer on flat plate. Turbulent and transitional boundary layer over flat plate. Boundary layer separation and its control stream lined bodies. Drag and lift for flow around cylinder, sphere and flat plate, Free fall of a body through fluid								
2	Dimensional and model analysis: Physical quantities and their dimensions. Dimensional homogeneity. Rayleigh's method. Buckingham's II theorem method. Utility of model analysis. Hydraulic similitude. Model laws. Scale effect, ship-model testing. Distorted models.	07	13.5 %	3,6	4	3,4			
3	Open Channel Flow:- Types and characteristics. Steady uniform flow through open channels. Chezy's Manning's- Bazin's-Kutter's equations. Determination of normal depth. Most economical sections. Specific energy and specific concepts, Critical flow-critical depth and velocity. Types of slopes. Specific energy in nonrectangular channels. Velocity distribution in open channels. Velocity and discharge measurement in open channels-Channel transitions. Use of Pitot tube, Current meters, Pitot tube, Weirs and flumes.	13	25%	2,3,4	1	3			
4	Steady non uniform flow, Flow through open channels:- Gradually varied flow- differential equation, free surface profiles, Backwater and drawdown curves, Length of G.W. flow. Rapidly varied flow- hydraulic jump in rectangular channels, sequential depths, loss of energy Transient flow- surges in open channels.	11	21 %	2,4	3	2			
5	Pipe Flow:- Pipe line with pump/turbine, pipe network. Water hammer in pipes-its effects,	**07**	13.5 %	3,4	3	2,3			

	Rigid water columns theory, elastic water column theory- sequence of events, pressure water and its velocity. Surge tank- uses and types								
6	Impact of jets on vanes- Stationary and moving, Flat and curves, flow over radial vane, applications compressible fluid continuity, momentum and energy equations, isothermal and adiabatic process, velocity of pressure wave, Mach number	07	13.5 %	2,4	3	2			

REFERENCES	
1.	Dave R.M., Fluid Mechanics part II
2.	Kumar K.L., Engineering Fluid Mechanics
3.	Mody P.N. &Sheth S.M., Hydraulics & Fluid Mechanics, Standard Book House.
4.	Ramamurtham S., Hydraulics, Fluid Mechanics and fluid machines, DhanpatRai Publishing Company, New Delhi.
5.	Bansal R.K., Fluid Mechanics and Hydraulic Machines, Laxmi Publications.
6.	Chow VenTe, Open channel Hydraulics
7.	Massary, Fluid Mechanics
8.	Garde R.J. &Mirajgaokar A.J., Engineering Fluid
9.	Garde R.J., Fluid Mechanics through Problems, New Age International Publishers.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

S.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **CVL 1401 L**	**Credits / Hours per week**	**2 P**
Semester	**II**	Year of Introduction: Year of Syllabus Revision: 2018	**Maximum Marks / Grade**	**50**

Course Outcome (CO) CVL 1401L

CO1 Laboratory experiment on flow measurement
CO2 Experimental Proof for fundamental principle
CO3 Demonstration of various types of fluid flow

Mode of Transaction	Practical, discussion and viva	**PSO1 is common for all experiments**

No.	Practicalsare based on syllabus of subject	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Determination of coefficient of Pitot tube	4 hours	CVL1401L	2,3,5	CO1	PSO2
2	Calibration of Orificemeter	4 hours	CVL1401L	2,3,5	CO1	PSO2
3	Determination of Rugosity coefficient for a rectangular flume	4 hours	CVL1401L	2,3,5	CO2	PSO2
4	Measurement of flow by Current meter	4 hours	CVL1401L	2,3,5	CO1	PSO2
5	Study of Hydraulic jump	4 hours	CVL1401L	2,3,4,5	CO2 CO3	PSO2, PSO4
6	Gradually varied flow	6 hours	CVL1401L	2,3,4,5	CO3	PSO2, PSO4

Programme Name: <u>B E Civil & IWM</u>

Bloom's Taxonomy (BT Levels): 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Analyse and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**		**Academic Year**	**2020-21**

S.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **CVL 1402 SURVEYING- II**	**Credits / Hours per week**	**4L**
Semester	**II**	Year of Introduction: **2020-21** Year of Syllabus Revision: 2019	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures, Tutorials and Drawing		

Course Outcome (CO) CVL 1402

CO1 Understand the geometry of Curves, types of curves, application of curve in real life.
CO2 Understand the principles of astronomy.
CO3 Identify different types of survey, basics of Geodetic survey.
CO4 Photogrammetry Survey and introduction of GPS.
CO5 Introduction of G.I.S and Remote sensing. Application in engineering projects

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional(R)/ Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Geometry of circular curves- degree of curve layout of curves by chain and tape – Rankine's method of deflection-obstacles in layout and of circular curves - Theodolite method, Numerical.	06 hrs	12%	1,2,3, 4,5	CO1	PSO2	**(Emp), (Ent), (SD)**	**(L),(N),(R), (G)**	**(ES), (PE)**
2	Geometry of compound and reverse curves, -. Ideal transition curve- Cubic parabola and field layout- numerical based on the same. Layout of the same in field- vertical curves	06 hrs	12%	1,2,3, 4,5	CO1	PSO2			

3	Computation of levels for vertical curves - Transition curves-theory-super elevation- Length of the transition curve; Ideal transition curve- Cubic parabola and field layout- numerical based on the same.	04 hrs	8%	1,2,3, 4,5	CO1	PSO2			
4	Geodetic survey:- Triangulation and precise traversing, Principles, Classification, Measurement of angles- Satellite station. Base line measurement - Reconnaissance survey and planning of subsequent operations. Theory of errors applied in adjustment of angles-computation.	07 hrs	13%	2,4	CO3	PSO3			
5	Photogrammetric Surveys and mapping. Aerial and terrestrial photogrammetry. Global Positioning System.	05 hrs	10%	3,4	CO4	PSO2			
6	Astronomy- Latitude, Longitude- true bearing of a survey lines - Celestial sphere and coordinate system for locating a celestial object Z.P.S. triangle, Time - Sidereal and solar time- Equation of time- Greenwich and local time-Simple methods of determining latitude, longitude and true bearing of x line.	10 hrs	18%	1,2,3, 4	CO2	PSO2			
7	Remote Sensing: Introduction, Principles of Energy Interaction in atmosphere and Earth surface features. Image interpretation techniques, visual interpretation, Digital Image Processing.	06 hrs	12%	2,3	CO4	PSO4			
8	Geographical Information System- Definition of GIS, Key components of GIS, Functions of GIS, Spatial data, Spatial Information System, Geospatial analysis, Integration of Remote Sensing and GIS, Applications in Civil Engineering.	08 hrs	15%	3,4	CO4	PSO4			

REFERENCES

1.	Surveying Vol-II by Kulkarni and Kanetkar
2.	Surveying Vol-II and III by B.C.Punamia
3.	Surveying Vol-II and III by K.R.Arora
4.	Advanced Surveying by S.Gopi, R. Sathikumar, and Madhu

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2020-21**

S.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **CVL 1402L SURVEYING- II: Field Practical, Discussion, Viva**	**Credits / Hours per week**	**02P**
Semester	**II**	Year of Introduction: **2020-21** Year of Syllabus Revision: 2019	**Maximum Marks / Grade**	**50**

Course Outcome (CO) CVL 1402L

CO1 Understand the geometry of Curves, types of curves, application of curve in real life.
CO2 Understand the principles of astronomy.
CO3 Identify different types of survey, basics of Geodetic survey.
CO4 Photogrammetric Survey and introduction of GPS.
CO5 Introduction of G.I.S and Remote sensing. Application in engineering projects

Mode of Transaction	Field Practical's, discussion and viva	**PSO1 is common for all experiments**

No.	Term-work / Field Practical shall be based on above syllabus	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Curves using non instrumental and Instrumental method with Total station	10 hours	CVL1402L	1,2,3,4	CO1	PSO2
2	Contour Survey with Total station	4 hours	CVL1402L	2,3,4	CO3	PSO2
3	Astronomy	4 hours	CVL1402L	2,3,4	CO2	PSO2
4	Demonstration of G.I.S and mapping	6 hours	CVL1402L	2,3,4,5	CO3	PSO2
5	Any other term-work based on syllabus	2 hours	CVL1402L	1,2	CO4	PSO2, PSO4

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil Engineering): Regular Programme

Programme Specific Outcome(PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.
PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.
PSO3 Analyse and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.
PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

S.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core** **CVL1403:Construction Technology-I**	**Credits / Hours per week**	**04**
Semester	**II**	Year of Introduction: 2007 Year of Syllabus Revision: 2012	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		**03(L) + 1(T)**

Course Outcome (CO)

CO1 Learn all aspects of scaffolding, shoring, under pinning
CO2 Conceptual learning of formwork.
CO3 Understanding and learning of Structures in brickwork and partition walls
CO4 Understanding and learning of Floors and Flooring
CO5 Understanding and learning of Roof and Roof Covering
CO6Learn all aspects of manual and mechanical vertical circulation
CO7 Understanding and conceptual learning of various special treatments like DPC, thermal insulation, fire protection and Acoustics
CO8 Learn all aspects of building finishes, Ventilation and Air conditioning

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics

									(PE)
1	Scaffolding, Types of Scaffolding, Brick layers Scaffolding, Double, Cantilever, Suspended, Steel Shoring, Types of Shoring, Inclined Shore, Horizontal , Dead Shore Underpinning, Pit method. Pile method, Chemical Consolidation	03	6	1,2	CO1	PSO2	**(Emp), (Ent), (SD)**	**(L),(N), (R), (G)**	**(PE)**
2	Formwork: Requirement of Formwork, Economy in Formwork, Materials used in Formwork and sizes of Formwork, Types of Formwork for different structural members, Formwork for column and floors, Formwork for walls, RCC beams and stairs	07	13	1,2	CO2	PSO2			
3	Structure in Brickwork: Pier & Wall Footing, Cavity wall, Composite Masonry, Fire Place, Buttress, Corbels, Circular Brickwork, Ornamental Brickwork, Reinforced Brickwork, Ornamental Brickwork, Partition Wall, Retaining wall & breast wall, Window sill, Threshold Partitions, Types of Partition, Brick partition, Glass partition, Timber partition, Metal partitions	04	8	1,2	CO3	PSO2			
4	Floors and floorings Floors: Timber floors, composite floors Flooring: Components, Selection of flooring ,Types of Flooring, Murum, Stone, Brick, Timber Flooring ,Cement Concrete, Mosaic, Terrazo, Tiled, Marble Flooring etc	07	13	1,2	CO4	PSO2			
5	Roof and Roof covering : terminology, Types of roofs, Various material used in Roof covering: Thatch, Shingles, Tiles, A.C Sheets, G.I Sheets, False Ceiling	06	12	1,2	CO5	PSO2, PSO4			
6	Manual Vertical Circulation :- (a) Stairs – Terminology, Characteristics of an Ideal Stair, Types of Stair and Stairhall, Types of steps. (b) lift and ascelators	05	10	1,2	CO6	PSO2			
7	Damp-proofing :- Causes of dampness, effects, methods of damp – proofing, materials used for damp-proofing, DPC treatment, Water Proofing Termite proofing:- Types of termites, anti-termite treatment, site preparation, soil treatment, physical structural barriers, post-construction treatment Thermal insulation: Terminology, Techniques for thermal insulation of Building components, Thermal insulation materials. Fire protection :- Terminology, Fire load, building and structural elements grading, Fire proofing materials, Characteristics of common building material with repect to fire resistance, fire alarm systems, fire	14 (5+9)	26	1,2,4	CO7	PSO2, PSO4			

	quenching equpiments Acoustics : Definitions, Basics of sound and its behavior in enclosed areas, Sound measurement unit, Materials used for sound insulation, Defects in Sound insulation,								
8	Building finishes :- Terminology, Ingredients in Paint, Types of Paints, Defects in painting Ventilation and Air conditioning: Terminology, Objectives and other aspects of ventilation and Air-conditioning	06	12	1,2,4	CO8	PSO2, PSO4			

Reference Books

1.	Shushilkumar, Building construction
2.	Sharma and Kaul, Building Construction
3.	B.C.Punamia, Building Construction
4.	Bindra and Arora, Building Construction

	The Maharaja Sayajirao University of Baroda **Faculty of Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

S.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core / ~~Elective / Foundation~~** **CVL1403L : Termwork**	**Credits / Hours per week**	**02**
Semester	**II**	Year of Introduction: 2007 Year of Syllabus Revision: 2016	**Maximum Marks / Grade**	**50**
Mode of Transaction		Discussion, drawing, and Tutorials	**PSO1 and PSO2**	

No.	**Termwork**	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Scaffolding	2	CVL1403L	3,4,6	CO1	PSO2, PSO3
2	Shoring and Under pinning	2	CVL1403L	3,4,6	CO1	PSO2, PSO3
3	Types of Stairs- I	4	CVL1403L	3,4,6	CO6	PSO2, PSO3
4	Types of Stairs- II & Lift	4	CVL1403L	3,4,6	CO6	PSO2, PSO3
5	Damp Proof Course	2	CVL1403L	3,4,6	CO7	PSO2, PSO3
6	Formwork	4	CVL1403L	3,4,6	CO2	PSO2, PSO3
7	Sloping Roof	2	CVL1403L	3,4,6	CO5	PSO2, PSO3
8	Roof Trusses	2	CVL1403L	3,4,6	CO5	PSO2, PSO3
9	Roof Coverings	2	CVL1403L	3,4,6	CO5	PSO2, PSO3
10	Structures in Brickwork	2	CVL1403L	3,4,6	CO3	PSO2, PSO3

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil Engineering): Regular Programme

Programme Specific Outcome(PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.
PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.
PSO3 Analyse and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.
PSO4 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty of Science** **Department of Civil Engineering**	**Academic Year**	**2020-21**

S.S OF B.E.-II (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**II**	**Core** **GEO1401:Engineering Geology**	**Credits / Hours per week**	**04**
Semester	**II**	Year of Introduction: Year of Syllabus Revision: 2017-2018	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		**03(L) + 1(T)**

Course Outcome (CO)

CO1 To Develop an understanding about various components of Earth and associated Processes
CO2 To understand various structures present in rocks
CO3 To understand various physical properties of rocks & minerals
CO4 Developing understanding related to Engineering Properties of Rocks and Soils.
CO5 Understanding and Learning Significance of geological conditions in civil-Engg. Projects.
CO5 Understanding the nature and causative factors of landslide and importance of groundwater studies in civil-Engg. projects

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)

1	Evolution of the Earth. Age and internal constitution of the earth. Earth-quakes volcanoes. Weathering processes – Geological work of river, wind, glaciers and groundwater.Principles of stratigraphy, Geological Time scale. Brief account of the important geological formations of India.	10	20	1,2	CO1	PSO1	**(Emp), (Ent), (SD)**	**(L),(N), (R), (G)**	**(PE)**
2	Concept of dip and strike. Different types of folds, faults and their machanism. Joints and their classification. Unconformities, outliers and inliers.	07	13	1,2,5	CO2	PSO1			
3	Physical properties of Minerals. Detailed study of rock forming minerals. Origin evolution and classification of igneous rocks, forms, structures and composition of igneous rocks. Classification of sedimentary rocks. Structural and mineralogical characters of sedimentary rocks. Metamorshism and Metamorphic rocks.	10	20	1,2	CO3	PSO1			
4	Engineering properties of rocks, geotechnical description and classification of rock masses. Soils – engineering properties and classification. Exploration methods : Geological, geophysical remote sensing, drilling and logging, percolation test. Rock, mass improvement techniques, grouting, enchoring, shear keys and bolting.	07	13	1,2,3,5	CO4	PSO1			
5	Geological considerations and geotechnical considerations related to dams, tunnels, bridges, highways and other Civil engineering structures.	08	14	1,2,3,5	CO5	PSO1			
6	Landslides : Mechanics and factors of slope failure classification, preventive measures and problems of road construction in hilly terrain. Seismic studies and construction of Civil engineering structures in seismic zones. Fundamentals of groundwater geology Groundwater studies in relation of Civil engineering works.	10	20	1,2,3,4	CO6	PSO1			

Reference Books

1.	Mukherjee P. K. Text book of Geology
2.	Singh Parbin Text book of Engineering and General Geology Katson Publishing
3.	Krynine D. P. and Judd, W. B. Engineering Geology and Geotechniques McGraw Hill Col. New York
4.	Blyth F. G. H. A Geology for Engineers' Amcld.

NOTE: THERE IS NO TERMWORK IN THIS SUBJECT

Bloom's Taxonomy Levels:

1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil-IWM)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Understand and analyse soil-water-plant relationships and to Identify and recommend methodologies and technologies for effective and sustainable solutions for soil and water conservation measures

PSO4 Evaluation, analysis and application of sources, storage, distribution, development and management of water resources and corresponding projects.

PSO5 Design, evaluation, training, demonstration of irrigation systems & exposure to advances in on-farm water management techniques and agricultural drainage systems

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Mechanics & Structural Engg.**	**Academic Year**	**2019-20**

F.S OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **APM1503:Structural Analysis-I**	**Credits / Hours per week**	**04**
Semester	**I**	Year of Introduction: 2007 Year of Syllabus Revision: 2012	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) APM1503

CO1 Students will study behavior of statically indeterminate structures by drawing SFD, BMD, & ATD associated with deflection patterns having maxima and minima values.

CO2 Students will perform different laboratory experiments based on theory topics which simplify the difficult topics in various ways and provide clarity of understanding for students.

CO3 Students will perform various practical based on materials like Cement, Sand and Concrete.

CO4 Students will study behavior of various types of beams and bridges under moving loads thus providing further understanding of the design subjects.

Unit No.	**Topic/Unit**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development	**Relevance to** Local (L)/ National (N)/ Regional	**Relation to** Gender (G), Environment and Sustaina

							(SD)	(R)/Global (G) developmental needs	bility (ES), Human Values (HV)and Professional Ethics (PE)
1.	**Influence line diagrams for beams and trusses**: Influence lines diagrams for beams and trusses – Rolling loads – Muller Breslau principle	15	25	2,3,4	CO1, CO2	PSO1 PSO2	EMP	L/G	ES
2.	**Analysis of indeterminate structures** Energy theorem I, Moment area theorem, Conjugate beam,Fixed and continuous beams under various loading patterns and with yielding of supports, unsymmetrical bending	15	25	1,2,3,4	CO1, CO2	PSO1 PSO2			
3.	**Basics of RCC design** Basics of R. C. C. design – Design theories – Design for flexure by L. S. method – Singly, doubly and flanged beams, Shear and development length – Deflection and cracking	18	30	3, 4,5	CO1 CO2	PSO1 PSO2			
4.	**Connections** Connections: Axial, Eccentric bolted and welded connections	12	20	3,4,5	CO1 CO2	PSO1 PSO2			

Reference Books

1.	Mechanics of Structures, Vol. II by S.B. Junarkar, Charotar Pub..
2.	Reinforced Concrete by H. J. Shah, Charotar Pub..
3.	Steel Structures by Vazirani and Ratwani, Khanna Pub.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Physics**	**Academic Year**	**2019-20**

F.S OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **APM1503L : Laboratory Practical**	**Credits / Hours per week**	**02**
Semester	**I**	Year of Introduction: 2007 Year of Syllabus Revision: 2016	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva	**PSO7 is common for all experiments**	

No.	**Experiment**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**
1	Fineness Test of Cement	2	6.7	2,3,5	CO3	PSO1 PSO2
2	Standard Consistency Test	2	6.7	2,3,5	CO3	PSO1 PSO2
3	Initial and Final setting time	2	6.7	2,3,5	CO3	PSO1 PSO2
4	Compressive strength of cement	3	10	2,3,5	CO3	PSO1 PSO2
5	Bulk density of aggregates	2	6.7	2,3,5	CO3	PSO1 PSO2
6	Sieve analysis	2	6.7	2,3,5	CO3	PSO1

						PSO2
7	Bulking of sand	2	6.7	2,3,5	CO3	PSO1 PSO2
8	Slump test	3	10	2,3,5	CO3	PSO1 PSO2
9	Compaction factor test	3	10	2,3,5	CO3	PSO1 PSO2
10	Compressive strength of concrete	3	10	2,3,5	CO3	PSO1 PSO2
11	Flexure strength of concrete	3	10	2,3,5	CO3	PSO1 PSO2
12	Tensile strength of concrete	3	10	2,3,5	CO3	PSO1 PSO2

Bloom's Taxonomy Levels:

1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil-IWM)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Understand and analyse soil-water-plant relationships and to Identify and recommend methodologies and technologies for effective and sustainable solutions for soil and water conservation measures

PSO4 Evaluation, analysis and application of sources, storage, distribution, development and management of water resources and corresponding projects.

PSO5 Design, evaluation, training, demonstration of irrigation systems & exposure to advances in on-farm water management techniques and agricultural drainage systems

Syllabus of Courses

The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**		**Academic Year**	**2019-20**

F.S OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **CVL 15XX: Basic Transportation Systems**	**Credits / Hours per week**	**04 hours/week**
Semester	**I**	Year of Introduction: 2019 Year of Syllabus Revision:	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) CVL 15XX

CO1 Learn basic transportation systems terminology - Railway, Bridge, Airport and Harbour Engineering
CO2 Understand the components of railway track and types of its elements
CO3 Understand the arrangements of the railway crossing, signals and station & yard
CO4 Learn airport planning, elementary runway design, air traffic control
CO5 Identify the bridge structure and understands the site selection criteria
CO6 Design the hydraulic aspect of bridge design
CO7 Classify the bridge superstructure, substructure and bearings
CO8 Understand types and site selection & planning criteria of harbour
CO9 Understands and learn the various marine structures

Unit No.	Topic	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional (R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional

									Ethics (PE)
1	**TRANSPORTATION STRUCTURES** 1. INTRODUCTION TO TRANSPORTATION SYSTEMS Transport Systems - Introduction, development of road transport, air transport, waterways, Comparison of various modes of transportation. 2. Types – Culverts, Bridge, fly-overs, components, classification, requirements, site selection, alignment, bridge sub structure & Super Structure - Super structure elements, bridge flooring, types of bridges, bridge bearings, joints in bridges, piers, abutments, wing walls and approaches, loads and stresses.	13	25	1,2,3	1,5,6,7	PSO1, PSO2	Emp	L/ N/ R	PE
2	**RAILWAYS** Permanent Way - Preliminary survey, reconnaissance survey, location survey, gauges, uniformity of gauges, types and functions of various components such as rails, sleepers, ballast, rail fastening etc., coning of wheels, Points and Crossings - Terminology, various types of track junctions, turnout and diamond crossing, Stations & yards, Modernization of railway - Rapid Transit	13	25	1,2,3	2,3	PSO1, PSO2			
3	**DOCKS AND HARBOURS** Harbours and Ports: Introduction, classification of harbor & port, requirements of a good harbor & port, principles of harbour planning, site selection criteria, Natural Phenomena: Wind, Wave tides and current phenomena, their generation characteristics and effect on marine structure, silting, erosion and littoral drift, Marine structures: Function, types, suitability and general design principles and construction features-Breakwater, Wharves, Quay, Pier, Jetties, Dolphin, Fender etc. Docks: Introduction, types, design consideration, Dock entrance-operation Navigational Aids: Necessity, types	13	25	1,2	8,9	PSO1			
4	**AIR TRANSPORT** Airport planning, Master plan guidelines as per ICAO and FAA, Surveys for site selection, Wind Rose diagram and its utility, Runway Design, Taxiway,Apron, Hanger, Radar, Planning of terminal area of airport, Classification of air ports, Instrument LandingSystem, Air Traffic Control, ICAO, FAA, AAI.	13	25	1,2,3	4	PSO1, PSO2			

Reference Books:

1.	"A text book of Railway Engineering" by S. C. Saxena and S. P. Arora, Publisher : Dhanpat Rai and Sons, New Delhi
2	"Principles of Railway Engineering" by S. C. Rangwala, Publisher: Charator pub. house
3	"Principles and Practice of Bridge Engg." by S.P. Bindra, Publisher: Dhanpatrai and sons
4	"Essentials of Bridge Engg." by D Johnson Victo, Publisher: Oxford &IBHPub.Co.

5	“Bridge Engg.” by S.Ponuswamy, Publisher: Tata Mcgraw Hill
6	“Docks & Harbour Engg.” by S. P. Bindra – Publisher: Dhanpat Rai and Sons
7	“Harbour, Dock and Tunnel Engg.” by R. Srinivasan, Publisher: Charotar Pub. house
8	“Design and Construction of Ports & Marine structures” by Quinn A linzodef, Publisher: Mcgrawhill Co.
9	“Airport Planning and Design” by Khanna S. K., Arora M. G., Jain S. S., Nem Chand & Bros, Roorkee

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Physics**	**Academic Year**	**2019-20**

F.S OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **CVL15XXL : Basic Transportation Systems : Termwork**	**Credits / Hours per week**	**02**
Semester	**I**	Year of Introduction: 2019 Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**
Mode of Transaction		Termwork		

No.	**Termwork**		**Course Code**	**BT Level**	**CO**	**PSO**
1	Drawing sheets in Railway Engineering section for: (a) Permanent ways, (b) Types of rails and sleepers, (c) Fastening, fixtures & rail joints and (d) Components of turnouts and track junction		CVL15XXL	1,2	1,2,3	PSO1
2	Drawing sheets in Bridge Engineering section for: (a) Bridge piers and abutments (b) Low cost bridges (c) Movable steel bridges		CVL15XXL	1,2	7	PSO1
3	Drawing sheets in Docks & Harbour Engineering section for: (a) Harbour layout (b) Mound Type and Vertical Wall Breakwater		CVL15XXL	1,2	9	PSO1
4	Drawing sheets for Airport obstructions		CVL15XXL	1,2	4	PSO1
5	Design examples in hydraulic aspects of bridge		CVL15XXL	3	6	PSO2
6	Solving problem of runway orientation in airport planning.		CVL15XXL	3	4	PSO2

Bloom's Taxonomy Levels:

1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil-IWM)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Understand and analyse soil-water-plant relationships and to Identify and recommend methodologies and technologies for effective and sustainable solutions for soil and water conservation measures

PSO4 Evaluation, analysis and application of sources, storage, distribution, development and management of water resources and corresponding projects.

PSO5 Design, evaluation, training, demonstration of irrigation systems & exposure to advances in on-farm water management techniques and agricultural drainage systems

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Physics**	**Academic Year**	**2019-20**

F.S OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **CVL1508 :** ESTIMATION, VALUATION AND PROFESSIONAL PRACTICE	**Credits / Hours per week**	**4L+2TW**
Semester	**I**	Year of Introduction: 2007 Year of Syllabus Revision: 2012	**Maximum Marks / Grade**	**100+50=150**
Mode of Transaction		Lectures and Tutorials	**B.E. Civil (Irrigation water management): Regular Programme**	

Course Outcome (CO)

CO1 Learn methods for Approximate and Detailed Estimate of Civil Engineering Works.
CO2 Analysis of Rates for various items of Civil engineering construction work.
CO3 Understanding method of preparing Tender document and inviting tender notice.
CO4 Learn various methods for allocation of Civil construction work on Contract basis and Administrative procedure followed for contract.
CO5 Learn all aspect of Valuation and methods of valuation of Real property.
CO6 Understanding the principle of specification writing, and drafting technical specification for items of Civil construction work.

Unit No.	Topic	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional (R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)

1.	Types of Estimate – Approximate and Detailed– Estimate of Civil Engineering Work Standard mode and units of measurements Estimate of Buildings – Residential Estimate of Buildings –Public	10	19%	**1,2**	CO1	**PSO1 PSO2**	**Emp & SD**	N, R	**PE**
2.	Estimate of RCC works , Column, Beam and Slab, Retaining wall, Estimate of Culvert, Road, Estimate of Water Supply and Sanitary works, Irrigation works, Estimate of steel structures.	6	12%	**1,2**	CO1	**PSO1 PSO2**	**Emp & SD**	N, R	**PE**
3	Task work of Labours, Material and Labour schedule Framing Rate analysis S.O.R.	6	12%	**2,4**	CO2	**PSO1 PSO2**	**Emp & SD**	N, R	**PE**
4	Tendering and contract procedures, Types and relative merits, P.W.D. System of administration accounts and Technical sanctions – Billing and Extra item works organization. Arbitration procedure.	13	25%	**1,2,5**	CO3 CO4	**PSO1**	**Emp & SD**	N, R	**PE**
5	Valuation – Terms related to the Valuation of Real property Factors affecting Valuation of Land and Building Depreciations methods, Sinking fund, Cash flow diagram. Methods of Valuation of Real property-Valuation tables– Valuation reports. Fixation of standard rent	11	21%	**3,4,5**	CO5	**PSO1 PSO2**	**Emp & SD**	N, R	**PE**
6	Specification – Writing principles Technical Specification for Earthwork, Brickwork, RCC	6	12%	**2,5,7**	CO6	**PSO1 PSO2**	**Emp & SD**	N, R, G	**PE**

Reference Books

1	Elements of Estimating and Costing (Professional practice) -S.C.Rangwala Pub., Charotar Book stall.
2	Estimating and costing – B.N.Dutta, Pub. : S.Dutta and Co.Lucknow.
3	Estimating and costing – S.P.Chandola and Vazirani, Pub. Khanna Pub.
4	Textbook of Estimates and costing (Civil Engg.) PG.S.Birdi, Pub., Dhanpatrai and sons.
5	Estimating, costing, specification and valuation in Civil Engg. principles and applications and M.Chakraborti Pub., M. Chakraborty 10th edition.
6	Valuation of Real properties – S.C.Rangwala pub. Charator book stall.
7	Civil Engineering contracts and estimates – Patil (Pub. Orient Longman).
8	Fundamentals of Public works procedure and Account – K.N.Pandya – pub. P.R.Mehta.
9	Quantity Survey (Estimation & CE Work – PLBHasin (Pub. S.C.Chand & Co.

10	Mode of Measurements of Civil Engineering Works – I.S.1200.

Bloom's Taxonomy Levels:

1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil-IWM)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Understand and analyse soil-water-plant relationships and to Identify and recommend methodologies and technologies for effective and sustainable solutions for soil and water conservation measures

PSO4 Evaluation, analysis and application of sources, storage, distribution, development and management of water resources and corresponding projects.

PSO5 Design, evaluation, training, demonstration of irrigation systems & exposure to advances in on-farm water management techniques and agricultural drainage systems

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **WRE1503:ENGINEERING HYDROLOGY**	**Credits / Hours per week**	**3L + 1T**
Semester	**I**	Year of Introduction : 1991 Year of Syllabus Revision : 2020	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1503

CO1 To understand the basic fundamentals of hydrologic cycle

CO2 To understand and analyze the effects pf urbanization on hydrology.

CO3 To understand types & forms of precipitation & to carry out rainfall analysis.

CO4 To emphasize on evaporation process & to be able to estimate evaporation.

CO5 To be familiarized with infiltration process & able to estimate infiltration rate & its indices.

CO6 To emphasis on runoff & its characteristics & to develop rainfall runoff relationship

CO7 To understand the flow behavior with respect to time and to become familiar with application of hydrograph.

CO8 To carry out flood frequency analysis and to be familiar with process of flood routing in reservoir and channels

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability	**Relevance to** Local (L)/	**Relation to** Gender (G),

							(Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	National (N)/ Regional (R)/Global (G)	Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Development in hydrology and it's role in water resources project. Hydrologic cycle. Hydrology as applied in engineering. Catchment characteristics. Drainage patterns. Classification of catchments. Weather & climate, humidity, temperature, radiation, wind. Definition of droughts. Classification of droughts. Drought management. Drought frequency.	6	12	1, 2	CO1	PSO4	Emp/ SD	L / N / R	ES
2	Introduction, Purpose & scope, Urbanization, Environmental effects, Urban hydrology, Urban hydrological research & development, Urban hydrological system, Urbanization & its effects on water cycle, Urbanization indices, Effects of urbanization on hydrology, Climatic effects, Changes in surface & groundwater flows, Current activities, Recommendation for international action	6	12	1, 2, 3, 4	CO2	PSO4			
3	Precipitation. Types and forms of precipitation. Characteristics of precipitation in India. Rain gauging instruments and their installation. Hydrometric network. Optimum network. Preparation of data. Presentation of rainfall data. Mean precipitation over an area. Depth area- duration relationships. Frequency of point rainfall. Intensity-duration-frequency relationship. Probable maximum precipitation. Design Rainfall, Construction of Design storm hyetograph	8	14	1, 2, 3, 4	CO3	PSO4			
4	Evaporation process. Factors controlling the evaporation process. Evaporimeters. Empirical evaporation equations. Water-budget determination of reservoir evaporation. Energy-budget determinations of reservoir evaporation. Aerodynamic determination of reservoir evaporation. Combination methods of estimating reservoir	6	12	1, 2, 3, 4	CO4	PSO4			

	evaporation. Estimation of reservoir evaporation from pan evaporation and related meteorological data. Reservoir evaporation and methods for its reduction.								
5	Infiltration process. Infiltration capacity of soil. Factors influencing infiltration capacity. Methods of determining infiltration capacity. Infiltration indices. Infiltration measurement. Cylindrical method. Ponding method. Measurement of infiltration in furrow. Blocked furrow method. Recycling furrow infiltrometer. Infiltration equations.	6	12	1, 2, 3, 4	CO5	PSO4			
6	Phenomena of runoff. Catchment characteristics and their effects on runoff. Climatic factors. Rainfall-runoff correlation. Methods of estimation. Flow rating curves. Determination of flow-rating curves. Adjustment and extension of flow-rating curves. Volume and durations of runoff. Estimating snow-melt runoff.	6	12	1, 2, 3, 4	CO6	PSO4			
7	Hydrograph, Factors affecting flood hydrograph. Components of hydrograph. Contribution of base flow to stream discharge. Separation of base flow and runoff. Evaluation of base flow. Effective rainfall. Determination of total runoff. Direct runoff hydrograph. Unit hydrograph. Derivation of unit hydrograph. Unit hydrographs of different durations. Use and limitations of unit hydrograph. Instantaneous unit hydrograph. Synthetic unit hydrograph. Unit hydrograph from catchment characteristics by FSR method.	8	14	1, 2, 3, 4	CO7	PSO4			
8	Flood formulae. Frequency analysis. Flood routing. Storage equation. Reservoir routing. Routing in river channel. Synthetic unit graphs from flood routing.	6	12	1, 2, 3, 4	CO8	PSO4			

Reference Books

1.	Raghunath H.M “Hydrology”, Wiley Eastern Publication
2.	Reddy Jayarami, “Engineering Hydrology”, Laxmi Publication
3.	Subramanya K, “Engineering Hydrology”, - Tata McGraw Hill Publication
4.	Engineering Hydrology – Wilson

5.	Urban Hydrology, Hydraulics & Storm Water Quality – Willey Publication – A. Osman, Akan & Robert J. Houghtalen
6.	Hall M. J. (1984), Ürban Hydrology", Elesvier Applied Science Publishers
7.	"Hydrological Effects of Urbanization", A report of the sub-group on the effects of urbanization on the hydrological environment, The UNESCO Press, Paris 1974, ISBN No.: 92-3-101223-1

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **WRE1503L : Laboratory Practical**	**Credits / Hours per week**	**2P**
Semester	**I**	Year of Introduction: 1991 Year of Syllabus Revision: 2020	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva		

No.	**Experiment**	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Demonstration of Raingauge	3	1503L	1,2,3,4	CO3	PSO4
2	Experiment on Pan Evaporimeter	4	1503L	1,2,3,4	CO4	PSO4
3	Evaporation in excavation tank	4	1503L	1,2,3,4	CO4	PSO4
4	Determination of infiltration rate by single ring infiltrometer	4	1503L	1,2,3,4	CO5	PSO4
5	Determination of infiltration rate by double ring infiltrometer	4	1503L	1,2,3,4	CO5	PSO4
6	On filed measurement of runoff	4	1503L	1,2,3,4	CO6	PSO4
7	Development of Hydrograph	3	1503L	1,2,3,4	CO7	PSO4

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **WRE1504 : GROUND WATER HYDRAULICS**	**Credits / Hours per week**	**3L + 1T**
Semester	**I**	Year of Introduction : 1991 Year of Syllabus Revision : 2020	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1504

CO1 To understand development, potential and legislate of ground water.

CO2 To be able to understand various type of aquifers and its properties.

CO3 To be familiar with behavior of well hydraulics in various flow condition and to understand multiple well system and its response under various flow condition.

CO4 To understand design of tube well and various component and understanding working of various types of pumps and its applications.

CO5 To study various surface and subsurface techniques of ground water investigation and artificial recharge.

CO6 To understand the concept of rainwater harvesting and its design criteria.

CO7 To study the effects of sea water intrusion and prevention strategies.

Unit No.	Topic	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability	Relevance to Local (L)/	Relation to Gender (G),

							(Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	National (N)/ Regional (R)/Global (G)	Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Introduction, Ground water development in India, Areas of groundwater potential in India, Conjunctive use of ground water, Ground water legislation and pollution	7	13	1, 2	CO1	PSO4	Emp/ SD	L / N / R	ES
2	Aquifers, Various types of aquifer, Ground water terminology, Aquifer properties, Specific yield, Determination of specific yield laboratory and field methods, Storage coefficient, Transmissibility, Ground water movement, Darcy's Law, Kozney's relations permeability, Factor affecting permeability, Relationship between storage coefficient, Barometric and tidal efficiencies	8	16	1, 2, 3, 4	CO2	PSO4			
3	Well hydraulics, Steady radial flow into a well situated in a confined and unconfined aquifer, unsteady radial flow in confined and unconfined aquifer Well flow near aquifer boundaries, Method of images, Multiple well systems	7	13	1, 2, 3, 4	CO3	PSO4			
4	Types of tube wells, Design of tube wells, Tube well construction, Percussion drilling, Hydraulic rotary drilling, Well development, Well completion, Yield test. Pumps. Types of pump, Shallow and deep well pumps	8	16	1, 2, 3, 4	CO4	PSO4			
5	Introduction to groundwater geophysics, Geophysical investigation, Different methods of ground water exploration techniques and Artificial recharge techniques, Induced infiltration, Water spreading recharge pits & shafts, Recharge wells, Rain water harvesting	8	16	1, 2, 3, 4	CO5	PSO4			
6	Introduction to rain water harvesting, Need for RWH, Advantages of	7	13	1, 2, 3	CO6	PSO4			

	RWH, RWH potential, Methods of RWH, Components methods of recharging subsurface aquifers, Design criteria for RWH and Case studies								
7	Saline water intrusion, Ghyben-Herzberg equation Slope, Shape and movement of interface, Prevention and control of saline water intrusion, artificial recharge	7	13	1, 2, 3	CO7	PSO4			

Reference Books

1.	Karanth, K. R. “Ground water assessment development and management”. Tata McGraw-Hill Publishing co.
2.	Michael, A. M. and Khepar, S. D. “Water Well and Pump Engineering”. Tata McGraw Hill Publishing Co.
3.	Raghunath, H. M. “Ground water”. Willey Eastern limited
4.	Todd, D. K. “Ground water hydrology”. John Wiley and sons

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **WRE1504L : Laboratory Practical**	**Credits / Hours per week**	**2P**
Semester	**I**	Year of Introduction: 1991 Year of Syllabus Revision: 2020	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva		

No.	**Experiment**	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Measurement of Groundwater Table	5	1504L	1,2,3,4	CO1	PSO4
2	Demonstration of various types of strainers	5	1504L	1,2,3,4	CO4	PSO4
3	Recharge in excavation tank	5	1504L	1,2,3,4	CO5	PSO4
4	Demonstration of electrical resistivity meter	6	1504L	1,2,3,4	CO5	PSO4
5	Demonstration of rainwater harvesting system	5	1504L	1,2,3,4	CO6	PSO4

Bloom's Taxonomy Levels:

1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil-IWM)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Understand and analyse soil-water-plant relationships and to Identify and recommend methodologies and technologies for effective and sustainable solutions for soil and water conservation measures

PSO4 Evaluation, analysis and application of sources, storage, distribution, development and management of water resources and corresponding projects.

PSO5 Design, evaluation, training, demonstration of irrigation systems & exposure to advances in on-farm water management techniques and agricultural drainage systems

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Mechanics and Structural Engineering**	**Academic Year**	**2019-20**

S.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**~~Core / Elective~~ / Foundation** **:STRUCTURAL ANALYSIS-II**	**Credits / Hours per week**	**04**
Semester	**II**	Year of Introduction: 2010 Year of Syllabus Revision: 2012	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures		

Course Outcome (CO) APM 1603

CO1 Understanding structural behavior using rotational stiffness aspect. It enables student to understand the lateral swing or the portals due to different affected conditions.

CO2 Drawing SFD & BMD by using joint rotation aspect under various loading conditions. Analysis of statically indeterminate structures using virtual column theory.

CO3 Application of bending strain energy and its application to draw SFD & BMD of statically indeterminate structures.

CO4 Verifying all the structural theory and proofs by performing different laboratory experiments which are based on complete syllabus thus it providesoverall clarity to students.

CO5 Understanding structural behavior of high rise structures under lateral loadings, development of solution for statically indeterminate structures by using matrix based theory.

Unit No.	Topic/Unit	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional (R)/Global (G) developmental needs	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Moment distribution method** Moment distribution for beams and frames	18	40	1,2,4,5	CO2	PSO1 PSO2			
2	**Slope deflection and Column analogy method** Slope deflection method for beams, Column analogy method for beams and frames	18	10	1,2,4,5	CO1, CO2	PSO1 PSO2	Emp	N/G	ES
3	**Analysis of frames** Energy Principle - applications to indeterminate structures, Hinged and portal frames, Building frames for wind and earthquake loadings.	15	30	2,3,4,5	CO1, CO3, CO5	PSO1 PSO2			
4	**Introduction to matrix methods** Introduction to matrix analysis of framed structures.	09	20	4,5	CO1, CO2, CO4	PSO1 PSO2			

Reference Books

1. Matrix analysis of framed structures by Weaver and Gere C.B.S. Pub.

2.	Mechanics of Structures, Vol. II by S.B. Junnarkar andH. J. Shah, CharotarPub..
3.	Structural analysis by Jack C. McCormac, Harper and row
4.	Indeterminate structures by C. K. Wang.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Mechanics and Structural Engineering**	**Academic Year**	**2019-20**

S.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**~~Core / Elective~~ / Foundation** **APM1603L: Laboratory Practical**	**Credits / Hours per week**	**02**
Semester	**II**	Year of Introduction: 2010 Year of Syllabus Revision: 2016	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, Graphics, discussion and viva		

No.	**EXPERIMENTS**	**Contact Hours**	**Weightage (%**	**BT Level**	**CO**	**PSO**
1	Forces in three wire suspension	2	8	1,3	CO4	PSO1, PSO2
2	Deflection in curved members	2	8	3,5	CO4	PSO1, PSO2
3	Continuous Beam by Three moment Theorem	2	8	3,4	CO4	PSO1, PSO2
4	Continuous Beam by Moment Distribution Method	4	12	2,3,4	CO4	PSO1, PSO2
5	Continuous Beam by Slope Deflection Method	4	12	2,3,4	CO4	PSO1, PSO2
6	Sway Forces in Portal frames	2	8	3,4	CO4	PSO1, PSO2
7	Horizontal Reaction in portal frames by M.D. Method	4	12	3,4	CO4	PSO1, PSO2
8	Horizontal Reaction in portal frames by Slope deflection method	4	12	3,4,5	CO4	PSO1, PSO2
9	Column Analogy Method	2	8	2,4	CO4	PSO1, PSO2
10	Tutorial-1	2	6	2,4	CO4	PSO1, PSO2
11	Tutorial-2	2	6	2,4	CO4	PSO1, PSO2

Bloom's Taxonomy Levels:

1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil-IWM)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Understand and analyse soil-water-plant relationships and to Identify and recommend methodologies and technologies for effective and sustainable solutions for soil and water conservation measures

PSO4 Evaluation, analysis and application of sources, storage, distribution, development and management of water resources and corresponding projects.

PSO5 Design, evaluation, training, demonstration of irrigation systems & exposure to advances in on-farm water management techniques and agricultural drainage systems

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Mechanics & Structural Engineering**	**Academic Year**	**2019-20**

S.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **APM1604 : GEOTECHNICAL ENGINEERING**	**Credits / Hours per week**	**04**
Semester	**II**	Year of Introduction: 2007 Year of Syllabus Revision: 2012	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Labs		

Course Outcome (CO) APM 1604

CO1 Student will learn about the Index properties and classification of soil to know the behavior of soil

CO2 Learning basic concept of compaction for preparation of various types of earth structures and permeability characteristics for earth dam components, filters and quantity of seepage.

CO3 Understanding the stress distribution under the load , consolidation settlement analysis , shear strength characteristics and bearing capacity analysis for design of foundation, retaining structures, slope stability analysis

CO4 Understanding the Lateral earth pressure for design of retaining structures

Unit No.	Topic/Unit	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship	Relevance to Local (L)/ National (N)/ Regional	Relation to Gender (G), Environment and Sustaina

							(Ent)/ Skill Development (SD)	(R)/Global (G) developmental needs	bility (ES), Human Values (HV)and Professional Ethics (PE)
1	**Introduction & Index properties of Soil**: Origin & occurring of soil, soil structure, Functional Relationships Physical and Index properties, Grain size distribution, Consistency of clays, Classification of soils	13	20.0	1,2,3	CO1	PSO1			
2	**Compaction & Permeability**: Compaction of soils (Laboratory and Field compaction), factors affecting compaction, Effect of compaction on engineering properties of soil Permeability, Darcy's law, factors affecting permeability, Flow nets and seepage	15	25.0	1,2,4	CO2	PSO2	EMP,SD	G	ES,PE
3	**Consolidation & Shear Strength**: Consolidation of soil, Evaluation of consolidation parameters, computation of settlement Shear strength of soil, Mohr- Column failure criteria, Laboratory shear strength measurements	15	25.0	2, 3, 4	CO3	PSO2			

4	**Stress Distribution**, **Earth Pressure, Bearing Capacity and Stability of Slopes** Stress distribution below soil mass, Boussinesq equations, pressure bulb, contact pressure, New Marks influence charts, Active and passive earth pressure conditions, Rankine's Earth pressure theories, Culmann's Graphical method bearing capacity, contact pressure, Stability analysis of slopes	17	30.0	3,4,5	CO3, CO4	PSO2			

Reference Books

1.	Soil Engineering Vol. I by Alam Singh, Asia Pub. House.
2.	Soil Mechanics and Foundation Engineering by B.C.Punamia, Std.Pub.
3.	Soil Behaviour by Lambe & Whitmann, Nostrand Co.
4.	Soil Mechanics by Oza H. P., Charotar Pub
5.	Basics and applied soil mechanics by A.S.Rao and Gopal Ranjan

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Physics**	**Academic Year**	**2019-20**

S.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **APM 1604L : GEOTECHNICAL ENGINEERING**	**Credits / Hours per week**	**02**
Semester	**II**	Year of Introduction: 2007 Year of Syllabus Revision: 2016	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva		

No.	**Experiment**	**Contact hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**
1	Water Content Test	2	6	1,2,3	CO1	PSO2
2	Field Density By Core Cutter And Sand Replacement Method	2	6	1,2,3	CO1	PSO2
3	Sieve Analysis	2	6	1,2,3	CO1	PSO2
4	Consistency Limits	2	7	1,2,3	CO1	PSO2
5	Standard Proctor Test	2	7	1,2,4	CO2	PSO2
6	Permeability Test	2	7	1,2,3	CO1	PSO2
7	Specific Gravity Of Soils	2	7	1,2,3	CO1	PSO2
8	Consolidation Test	2	7	2, 3, 4	CO3	PSO2
9	Unconfined Compressive Strength Test	2	7	2, 3, 4	CO3	PSO2
10	Direct Box Shear Test	2	8	2, 3, 4	CO3	PSO2
11	Samplers and sampling	2	8	3,4,5	CO4	PSO2

13	Triaxial Test	2	8	2, 3, 4	CO3	PSO2
14	Standard Penetration Test	2	8	3,4,5	CO4	PSO2
15	Plate Load Test	2	8	3,4,5	CO4	PSO2

Bloom's Taxonomy Levels:

1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil-IWM)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Understand and analyse soil-water-plant relationships and to Identify and recommend methodologies and technologies for effective and sustainable solutions for soil and water conservation measures

PSO4 Evaluation, analysis and application of sources, storage, distribution, development and management of water resources and corresponding projects.

PSO5 Design, evaluation, training, demonstration of irrigation systems & exposure to advances in on-farm water management techniques and agricultural drainage systems

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Mechanics**	**Academic Year**	**2020-21**

S.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **APM 1605: Structural Design - I**	**Credits / Hours per week**	**04**
Semester	**II**	Year of Introduction: 2007 Year of Syllabus Revision: 2012	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) APM 1605

CO1 Student can learn about application of fundamental concepts, techniques in analysis and design of reinforced concrete elements with codel requirements i.e. beam and Continuous beam

CO2 Student will be able to apply the fundamental concepts, techniques in analysis and design of reinforced concrete elements with codel requirements i.e. Column and Foundation

CO3 Student will be able to apply the fundamental concepts, techniques in analysis and design of reinforced concrete elements with codel requirements i.e. Slab and Continuous Slab

CO4 Student will be able to learn about analysis and design of various types of steel connections using rivets, bolts and weld.

CO5 Student will be able to design the basic elements of a steel building like beam, column, and column bases etc. for given conditions and loading.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability	**Relevance to** Local (L)/	**Relation to** Gender (G),

							(Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	National (N)/ Regional (R)/Global (G)	Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Introduction to properties of concrete and design theories: Introduction – Materials used for concrete – Properties of wet and set concrete – Quality control for concrete construction – Reinforced Concrete – Design theories– Design for flexure – singly and doubly reinforced rectangular and flanged beams, using working stress and limit state methods	12	20	1,2	CO1	PSO1, PSO2	Emp/Ent/ SD	N	PE
2	Design of Reinforced concrete members: Shear and development length – Bearing stress round the bend – Serviceability requirements. Simply supported and cantilever beams and one way slabs. Axially loaded columns – Axially and eccentrically loaded square and rectangular isolated footings.	24	40	2,3,4	CO1, CO2, CO3	PSO1, PSO2	Emp/Ent/ SD	N	PE
3	Introduction to steel design and design of connections: Introduction – Riveted and bolted connections for axial and eccentric loads.	12	20	2, 3, 4	CO4	PSO1, PSO2	Emp/Ent/ SD	N	PE
4	Design of steel members: Beams and compound beams with all checks – Beam subjected to bending about two axes.	12	20	2,3,4	CO5	PSO1, PSO2	Emp/Ent/ SD	N	PE
Reference Books									
1.	Reinforced Concrete by H. J. Shah, Charotar Pub.								

2.	Reinforced Concrete by A. K. Jain, Nemchand Bros.
3.	Design of Steel Structures by L. S. Negi.
4.	Design of Steel Structures by Arya and Ajmani, Nemchand Bros.
1.	Reinforced Concrete by H. J. Shah, Charotar Pub.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Mechanics**	**Academic Year**	**2020-21**

S.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **APM 1605L: Laboratory Practical**	**Credits / Hours per week**	**02**
Semester	**II**	Year of Introduction: 2007 Year of Syllabus Revision: 2012	**Maximum Marks / Grade**	**50**
Mode of Transaction		Tutorial, drawing, discussion and viva		

No.	**Tutorial/Drawing Sheet**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**
1	Tutorial 1: Load calculation for Typical floor of multi storey building.	5	9	2,3,4	CO1,CO2, C03	PSO1
2	Tutorial 2: Analysis and design of residential bungalow.	5	9	2,3,4	CO1,CO2, C03	PSO2
3	Drawing Sheet 1: Foundation layout and details for residential bungalow.	5	8	2,3	CO1,CO2, C03	PSO1, PSO2
4	Drawing Sheet 2: Plinth level layout and details for residential bungalow.	5	8	2,3	CO1,CO2, C03	PSO1, PSO2
5	Drawing Sheet 3: Lintel level layout and details for residential bungalow.	5	8	2,3	CO1,CO2, C03	PSO1, PSO2
6	Drawing Sheet 4: Typical slab level layout and details for residential bungalow.	5	8	2,3	CO1,CO2, C03	PSO1, PSO2

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Program Name: B. E. (Civil- IWM)

Program Specific Outcome(PSO)

PSO1 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions

PSO2 Analyse and design civil engineering structures and systems which are cost effective, socially acceptable, and environment friendly.

PSO3 Identify and recommend materials and technologies for effective and sustainable solutions.

Syllabus of Courses

The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**		**Academic Year**	**2019-20**

S.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **CVL 1601: Environmental Engineering I**	**Credits / Hours per week**	**04**
Semester	**II**	Year of Introduction: 2007 Year of Syllabus Revision: 2012	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) CVL 1601

CO1 Estimating quantity of water for a community and quantity of domestic wastewater for a given locality
CO2 Understanding the quality parameters for drinking water and wastewater and its application.
CO3 Evaluating source characteristics and methods of water extraction for community supply
CO4 Designing at Preliminary level systems for water transmission and distribution
CO5 Recognizing occupational diseases, environmental sanitation problems and methods to deal with

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional ®/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Water Requirement- Per capita demand, recommendations	09	17	1, 2, 3	CO1		Emp, Ent	L, N, R,	ES, PE

	for per capita demand, various types of water demand- domestic, institutional and industrial, public use, UFW- recommended values Fire demand – types of system- fire hydrant and static tank, factors influencing water requirement, recommended values, Factors influencing per capita demand Variations in water demand- Seasonal, monthly, daily and hourly variations, coincident draft, design flow for various components of water supply scheme- Numerical example Design period, Factors governing length of design period, recommended values Methods of population forecasting-suitable application of each method, numerical examples on population forecasting and water requirement Water conservation in buildings- Use of water saving devices and fixtures, dual plumbing system							G	
2	Sources of water- quantity and quality for public supply Raw water intakes- Functions, site selection, types of intakes, design criteria, design problems	07	13.5	2, 3	CO3				
3	Types of sewerage system, quantity of sanitary sewage, variations in sewage flow	02	04	2, 3, 4	CO1				
4	Water and waste water Quality Drinking Water Quality Standards Physical, chemical, bacteriological and biological water quality parameters Sources of impurities, impact, measurement, numerical examples Indian Standards for disposal of treated effluent Physical and chemical characteristics of sewage, numerical examples	08	15.5	1, 2, 3,4	CO2				
5	Water Transmission Design of transportation systems, structural requirement Material of construction Appurtenances, anchorages	06	11.5	2,3,4	CO4				

6	Water Distribution- Distribution systems Basic requirements of capacity and pressure, hydraulic design Network analysis system layout Fire hydrants, house connections, distribution reservoirs Pumping : Necessity, pumps-types, characteristics, selection, cavitation	08	15.5	2,3,4	CO4				
7	Environmental sanitation :- Terms and definitions Water-borne diseases, air sanitation Day lighting of Building and calculations, Artificial lighting Excreta disposal, arthropod borne diseases, rodent control, occupational health	06	11.5	2,3	CO5				
8	Occupational health- Terms, influencing factors, occupational diseases, Engineering control methods, Vital statistics Refuse classification, Characteristics, Quantity estimation, Collection and transport Methods of Refuse disposal, excreta disposal	06	11.5	2,3	CO5				

Reference Books

1.	Water Supply Engineering- S. k. Garg
2.	Sanitary Engineering- S.K. Garg
3.	Water Supply Engineering (Vol I)- B.C. Punmia and Ashok Jain
4.	Wastewater Engineering (Vol II)- B.C. Punmia and Ashok Jain
5.	Water supply and sanitary E ngineering- G.S. Birdie and J.S.Birdie
6.	Water and Wastewater Engineering: Water Supply and Wastewater Removal- Fair, Geyer, and Okun
7.	Manual on water supply and treatment. Ministry of Urban Development, New Delhi
8.	Manual on sewerage and sewage treatment. Ministry of Urban Development, New Delhi
9.	Environmental Engineering- Peavy, Rowe and Tchobanoglous

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

S.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **CVL 1601L : Laboratory Practical**	**Credits / Hours per week**	**02**
Semester	**II**	Year of Introduction: 2007 Year of Syllabus Revision: 2016	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva		

No.	**Experiment**		**Course Code**	**BT Level**	**CO**	**PSO**
1	Drinking Water Standards	1	**CVL 1601L**	1,2	CO2	
2	Treated Waste Water Disposal Standards	1		1,2	CO2	
3	Determination of Total Solids	1		2,3,4	CO2	
4	Determination of Total Hardness	1.5		2,3,4	CO2	
5	Determination of Carbonate Hardness	1.5		2,3,4	CO2	
6	Determination of Chlorine Demand	1.5		2,3,4	CO2	
7	Determination of Residual Chlorine	1.5		2,3,4	CO2	
8	Determination of Dissolved Oxygen (D.O)	2		2,3,4	CO2	
9	Determination of Biochemical Oxygen Demand (B.O.D)	2		2,3,4	CO2	
10	Determination of Chemical Oxygen Demand (C.O.D)	2		2,3,4	CO2	
11	Determination of Most Probable Number (MPN) of coliform organism	2		2,3,4	CO2	
12	Determination of pH	1		2,3,4	CO2	
13	Determination of Turbidity (N.T.U)	1		2,3,4	CO2	
14	Chemical Coagulation of Water	2		2,3,4	CO2	
15	Determination of Iron	2		2,3,4	CO2	
16	Determination of Fluoride	2		2,3,4	CO2	
17	Observation of Microorganisms	1		1,2	CO2	

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

S.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **WRE1602: SOIL AND WATER CONSERVATION ENGINEERING**	**Credits / Hours per week**	**3L + 1 T**
Semester	**II**	Year of Introduction : 2006 Previous Year of Syllabus Revision : 2021	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1602

CO1 To understand various properties on soil & its movement in to soil

CO2 To be familiar with different soil moisture constants

CO3 To study soil erosion and its estimation, soil loss models

CO4 To study various types of soil erosion

CO5 To study control and conservation practices of soil erosion

CO6 To understand various sediment load & its effect on sediment - quality – quantity

CO7 To get familiar with watershed & demarcation on watershed boundaries and related studies and to study various watershed development case studies in India

CO8 To study in detail on-farm water conservation methods and to have hands on practice of software for watershed delineation and demarcations.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability	**Relevance to** Local (L)/	**Relation to** Gender (G),

							(Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	National (N)/ Regional (R)/Global (G)	Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Nature and properties of soil. Chemical properties. pH. Salinity, ESP, SAR. Macro and micro nutrients. Toxic elements. Biological properties. Organic matter. Micro organism. Water relations of soil. Kinds of soil water. Movement of water into soils. Soil moisture retention and movement. Viscosity. Surface tension and capillary soil moisture tension.	7	13	1, 2	CO1	PSO3	Emp/ SD	L / N / R	ES
2	Soil moisture constants. Saturation capacity. Field capacity. Moisture equivalent. Permanent wilting percentage. Available water. Soil water potential energy concept. Soil moisture measurement methods. Plant water relationship. Soil profile. Major group of soil. Land use classification.	9	17	1, 2, 3, 4	CO2	PSO3			
3	Soil erosion. Geological erosion. Accelerated erosion. Types of soil erosion. Wind erosion. Water erosion. Estimation of soil erosion. Soil loss models.	10	20	1, 2, 3, 4	CO3	PSO3			
4&5	Controlling soil erosion. Soil erosion by wind. Soil erosion by water. Land capability classes. Soil conservation practices. Vegetative practices. Mechanical practices. Erosion Control in torrent and gullies.	7	13	1, 2, 3, 4	CO4 CO5	PSO3			
6	Sedimentation. Sediment yield models. Sediment graphs. Bed load models	6	12	1, 2, 3, 4	CO6	PSO3			
7	Watershed management. Need for watershed management. Expected benefits. Watershed as a unit of development. National watershed atlas. Demarcation of watershed boundary. Categorization of	7	13	1, 2, 3, 4	CO7	PSO3			

	watersheds. Resource inventory. Socio economic survey. Participatory rural appraisal. Project formulation strategy. Contents of project proposal. Technical plan. Watershed development and management-case studies.								
8	On-farm water conservation methods. Farm Ponds, Excavation Tanks and to have hands on practice of software for watershed delineation and demarcations.	6	12	1, 2, 3, 4	CO8	PSO3			

Reference Books

1.	Dastane, N. G. "A Practical Manual in Irrigated Agriculture", Nav Bharat Prakashan, Pune.
2.	Dhruvanarayana, V. V. "Soil and Water Conservation Research in India". Indian Council of Agricultural Research.
3.	Ghanshyam Das. "Hydrology and Soil Conservation Engineering" Prentice Hall of India Pvt. Ltd., New Delhi.
4.	Gupta, S. K. & Gupta, T. C. "Management of Saline Soils & Waters", Selectifile Publishing.
5.	Gurmel Singh, Venkatramanan, C., Sastry, G. and Joshi, B. P. "Manual of Soil and Water Conservation Practices". Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6.	James, D. W., Hanke, R. J., Jurinak. "Modern Irrigated Soils", John Wi8lley & Sons, New York.
7.	Kolay, A. K. "Basic Concepts of Soil Science", Wiley Eastern Limited.
8.	Michael, A. M. "Irrigation Theory and Practice", Vikas Publishing House, New Delhi.
9.	Misra, R. D. & Ahmed, M. "Manual of Irrigation Agronomy", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
10.	Schwab, G. O., Frevert, R. K., Edminster, T. W. and Barnes, K. K. "Soil and Water Conservation Engineering". John Wiley & Sons, New York.
11.	Maitra, M.K. "Watershed Management – Project Planning, Development and Implementation" Omega Scientific Publisher, New Delhi.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

S.S. OF B.E.-III (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**III**	**Core / ~~Elective / Foundation~~** **WRE1602L: SOIL AND WATER CONSERVATION ENGINEERING**	**Credits / Hours per week**	**Year**
Semester	**II**	Year of Introduction : 2006 Previous Year of Syllabus Revision : 2021	**Maximum Marks / Grade**	**Semester**
Mode of Transaction		Laboratory Experiments, discussion and viva		

No.	**Experiment**	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Determination of field density by core cutter method	2	1602L	1,2,3,4	CO2	PSO3
2	Determination of field density by water displacement method	3	1602L	1,2,3,4	CO2	PSO3
3	Determination of specific gravity by density bottle method	3	1602L	1,2,3,4	CO2	PSO3
4	Particle distribution test of soil	3	1602L	1,2,3,4	CO2	PSO3
5	Determination of organic matter content in the given soil sample sedimentation analysis	2	1602L	1,2,3,4	CO2	PSO3
6	Sedimentation analysis	2	1602L	1,2,3,4	CO2	PSO3
7	Double ring infiltrometer test	7	1602L	1,2,3,4	CO2	PSO3
8	Tensiometer	2	1602L	1,2,3,4	CO2	PSO3
9	Pressure plate technique	2	1602L	1,2,3,4	CO2	PSO3
10	Hands on practice of software for watershed delineation and demarcations.	2	1602L	1,2,3,4	CO7	PSO3
11.	Design of Farm Ponds	2	1602L	1,2,3,4	CO8	PSO3

12.	Design of Excavated Tanks	2	1602L	1,2,3,4	CO8	PSO3

Bloom's Taxonomy Levels:

1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil-IWM)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Understand and analyse soil-water-plant relationships and to Identify and recommend methodologies and technologies for effective and sustainable solutions for soil and water conservation measures

PSO4 Evaluation, analysis and application of sources, storage, distribution, development and management of water resources and corresponding projects.

PSO5 Design, evaluation, training, demonstration of irrigation systems & exposure to advances in on-farm water management techniques and agricultural drainage systems

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of AppliedMechanics**	**Academic Year**	**2020-21**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **APM1701:STRUCTURAL DESIGN - II**	**Credits / Hours per week**	**04**
Semester	**I**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Drawing Sheets		

Course Outcome (CO) APM1701

CO1 Students will be able to learn about the applications of Design concept, Methodology, and Indian Standard Codes for Design of Reinforced Concrete Structures.

CO2 Students will be able to learn about the applications of Design concept, Methodology, and Indian Standard Codes for Design of Prestressed Concrete Structures.

CO3 Students will be able to learn about the applications of Design concept, Methodology, and Indian Standard Codes for Design of Steel structures.

CO4 Students will be able to understand approximate methods of analysis for earthquake and wind loads on structures.

CO5 Students will be able to understand of the connectivity of theoretical and practical applications of structure design.

CO6 Student will be able to understand about the creation of structural design drawings for various structures and its components based on design data.

Unit No.	Topic/Unit	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/ Global (G) development al needs	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Design of reinforced concrete structures:** Portal frames and building frames Combined footing, Pile footing, Raft foundation. Water tanks, resting on ground, overhead tanks.	22	38	2,3,4, 6	CO1, CO4, CO5	PSO2	Emp, SD	National (N)	PE
2	**Elements of prestressed concrete:** Elements of Prestressed concrete.	16	12	2,3,4, 6	CO2, CO5	PSO2			
3	**Design of steel industrial building:** Introduction to industrial bents - gantry girders. Purlin and side sheeting rails - Different kinds of Purlins used in practice – Rooftruss. Side stanchion - Crane Column - gable column - bracings.	12	37	2, 3, 4,6	CO3, CO5	PSO2			
4	**Design of steel bridges:** Simple steel bridges - foot bridge - detailing of structures.	10	13	2,3,4	CO3, CO5	PSO2			

Reference Books	
1.	Reinforced concrete Vol. I and II by H. J. Shah, Charotar Pub.
2.	Reinforced Concrete by A. K. Jain, Nemchand Bros.
3.	Concrete Structures by Sushil Kumar, Standard Book House.
4.	Steel Structures by Arya and Ajmani, Nemchand Bros.
5.	Design of Steel Structures by Kazimi and Jindal, Prenctice Hall.
6.	Steel Designers Manual - ELBS Publications.
7.	Steel Structures by Ramchandra, Standard Book House.
8.	Prestressed Concrete by N. Krishna Raju
9.	Advanced Reinforced Concrete by Krishna Raju
10.	IS 456-2000, IS 13920-2016, IS 800-2007, IS-1893-2016,IS-875-Part-3-2015,IS1343-2012

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of AppliedMechanics**	**Academic Year**	**2020-21**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **APM1701L:STRUCTURAL DESIGN – II T/W & VIVA**	**Credits / Hours per week**	**2**
Semester	**I**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**
Mode of Transaction		Structural Design Drawing sheets, discussion and viva		

No.	**Structural Drawing Sheet**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**
1	Sheet 1:Structural Layout and Details of Combined Footing	5	8	2,3,5,6	CO6	PSO2
2	Sheet 2: Structural Layout and Details of Intze Tank/ Overhead Water Tank	5	7	2,3,5,6	CO6	PSO2
3	Sheet 3: Structural Layout and Details of Portal Frame	4	7	2,3,5,6	CO6	PSO2
4	Sheet 4: Analysis of Steel Roof Truss	4	7	2,3,4,5,6	CO6	PSO2
5	Sheet 5: Structural Layout and Details of Steel Roof Truss	4	7	2,3,5,6	CO6	PSO2
6	Sheet 6: Structural Layout and Details of Industrial Building	4	7	2,3,5,6	CO6	PSO2
7	Sheet 7: Structural Layout and Details of Steel Foot Bridge	4	7	2,3,5,6	CO6	PSO2

Bloom's Taxonomy Levels:

1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: B.E. (Civil-IWM)

Programme Specific Outcome (PSO)

PSO1 Apply knowledge of mathematics, science and basic engineering fundamentals to solve problems of Civil Engineering.

PSO2 Demonstrate knowledge and understanding of principles of Civil Engineering by using tools and methodologies to provide application oriented solutions.

PSO3 Understand and analyse soil-water-plant relationships and to Identify and recommend methodologies and technologies for effective and sustainable solutions for soil and water conservation measures

PSO4 Evaluation, analysis and application of sources, storage, distribution, development and management of water resources and corresponding projects.

PSO5 Design, evaluation, training, demonstration of irrigation systems & exposure to advances in on-farm water management techniques and agricultural drainage systems

Syllabus of Courses

The Maharaja Sayajirao University of Baroda **Faculty of Technology and Engineering** **Department of Civil Engineering**		**Academic Year**	**2019-20**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective / Foundation~~** **CVL1708: Environmental Engineering-II**	**Credits / Hours per week**	**04**
Semester	**I**	Year of Introduction: 2007 Year of Syllabus Revision: 2012	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) CVL1709

CO1 To understand basic concepts of unit operations and processes of water and sewage treatment
CO2 To learn design of conventional water and sewage treatment plants
CO3 To understand environmental impacts due large scale irrigation projects
CO4 To understand basic aspects for reuse of wastewater in irrigation water

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Water and wastewater treatment system, purpose of water and wastewater treatment and selection of treatment systems	04	7	2,3	CO1	PSO2	Emp, Ent	L, N, R, G	ES
2	Physical and chemical treatment, Introduction to physical and chemical treatment processes, Screening, Grit removal,	10	20	2,3,5	CO1 CO2	PSO2			

	Sedimentation, Coagulation, Filtration, Chlorination, iron and manganese removal, design of primary treatment processes								
3	Biological unit processes, Introduction to various biological unit processes, bacterial growth and its kinetics, Design of biological treatment processes for sewage treatment	09	17	2,3,5	CO1 CO2	PSO2			
4	Anaerobic digestion, Principles of action, design, disposal of sludge, septic tank, bio gas production, design of anaerobic treatment process with sludge drying	07	14	2,3,5	CO1 CO2	PSO2			
5	Effluent disposal and reuse of wastewater, Receiving water and effluent standards, disposal on land, wastewater reuse for irrigation	05	10	1,2,3	CO3 CO4	PSO2			
6	Land treatment by wastewater, development of land, land treatment, overland flow, land application of sludge, sewage farming, loading consideration, Design and management of sewage farms	06	11	2,3	CO3 CO4	PSO2			
7	Irrigation water quality and its effect on land and crops, physical and chemical impurities of water and wastewater, its effect on different crops and land, loading criteria development of land after prolonged irrigation	06	11	2,3	CO3 CO4	PSO2			
8	Environmental impact assessment , impacts due to irrigation, canal and reservoir, effects of air pollution on crops	05	10	2,3	CO3 CO4	PSO2			

Reference Books

1.	Metcalf & Eddy : Waste-water Engg. Treatment and disposal
2.	M.N.Rao & H.V.N.Rao – ‘Air pollution’
3.	G.S.Birdi, ‘Water supply and sanitary Engg.’
4.	V.N.Gharpure “A Text book of Water supply Engg. Theory, design and practice.
5.	Santosh kumar Garg, ‘Water Supply Engg.’
6.	Santosh kumar Garg, ‘Sanitary Engg.’
7.	Manual on water supply and treatment. Ministry of works and Housing, New Delhi.
8.	Manual on ‘Sanitary Engg. and Sewage treatment, Ministry of works and Housing, New Delhi

	The Maharaja Sayajirao University of Baroda **Faculty of Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**I**	**Core / ~~Elective / Foundation~~** **CVL1708L : Term work**	**Credits / Hours per week**	**02**
Semester	**I**	Year of Introduction: 2007 Year of Syllabus Revision: 2016	**Maximum Marks / Grade**	**50**
Mode of Transaction		Discussion, Field visit, design project, and viva	**PSO1 and PSO2**	

No.	**Term work**		**Course Code**	**BT Level**	**CO**	**PSO**
1	Design and detailed engineering drawing of conventional sewage treatment plant		CVL1708L	3,4,6	CO1 CO2	PSO2
2	Design and detailed engineering drawing of conventional Water treatment plant		CVL1708L	3,4,6	CO1 CO2	PSO2

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1705 : WATER RESOURCES ENGINEERING**	**Credits / Hours per week**	**3L + 1T**
Semester	**I**	Year of Introduction : 1991 Year of Syllabus Revision : 2020	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1705

CO1 To understand the fundamental of reservoir planning & to carry out economic analysis in water resources planning.

CO2 To familiar with the reservoir zones & its capacity including its yield and to identify demand patterns for multipurpose reservoir to develop rule curves and operating tables for the same.

CO3 To introduce them with classification of types of dams, including their site selection & investigation to be carried out.

CO4 To make them familiar with various types of earth dam their design including failure & stability analysis.

CO5 To make them familiar with various types of gravity dam their design including failure & stability analysis.

CO6 To introduce them with different type of spillways including the study of energy dissipaters & also design of ogee spillway.

CO7 To identify fundamental of diversion head works & carry out uplift pressure analysis using subsurface theories.

CO8 To understand the layouts and methods of water distribution systems.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability	**Relevance to** Local (L)/	**Relation to** Gender (G),

							(Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	National (N)/ Regional (R)/Global (G)	Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Planning for water resources development. Various purposes served by water resources development projects. Classification of water resources development projects. Water requirement of multipurpose projects. Compatibility of multipurpose uses. Planning of water resources development projects. Engineering economy in water resources development projects. Estimation of benefit-cost ratio. Economic analysis of water resources projects. Capital budgeting. Some common pitfalls in water resources planning.	6	12	1,2,4	CO1	PSO4	Emp/ Ent/ SD	L/N/R/G	ES, HV
2	Reservoir planning. Types of reservoirs. Available storage capacity of a reservoir. Investigations for reservoir planning. Selection of site for a reservoir. Capacity-elevation and area elevation curves of a reservoir site. Storage zones of a reservoir. Mass inflow curve and demand curve. Determination of the required capacity. Fixing the reservoir capacity for the computed value of the dependable yield of the reservoir catchment. Relation between the inflow outflow and storage data for a reservoir. Fixing the reservoir capacity from the annual inflow and outflow data. Determination of yield of reservoir. Analytical method for determination of storage capacity of a reservoir. Demand patterns and optimal operation. Operation plan of a multipurpose reservoir. Apportionment of the total cost of a multipurpose reservoir. Reservoir sedimentation. Reservoir losses. Reservoir clearance.	8	14	1,2,3,4	CO2	PSO4			
3	Dam Engineering. Different classification for dams. Types of dams. Selection of site for a dam. Selection of type of dam. Investigation of	6	12	1,2,3	CO3	PSO4			

	dam sites. Engineering surveys. Geological investigations. Sub-surface exploration programme.								
4	Earth dams. Types of earth dams. Foundation requirements. Causes of failure of earth dams. Criteria for safe design of earth dams. Preliminary section of earth dam. Typical cross sections of earth dams. Checking the stability of an earth dam. Seepage analysis. Phreatic line in an earth dam. Phreatic line for a homogeneous earth dam with or without a horizontal drainage system. Slope stability analysis. Stability of downstream slope during steady seepage condition. Stability of upstream slope during sudden drawdown condition. Seepage control measures. Measures to control seepage through foundations. Drainage of earth dams. Design of filters. Surface protection of upstream and downstream face of dam. Rockfill dams. Earth core rockfill dams. Design consideration for a rockfill dam. Composite earth-rockfill dam.	8	14	1,2,3,4,5,6	CO4	PSO4			
5	Gravity dam. Basic definition. Forces acting on dams. Load combination for design of a gravity dam. Requirements for stability of gravity dams. Internal stresses and stress concentrations in gravity dams. Design of gravity dam. Elementary profile of gravity dam. Practical profile of gravity dam. Limiting height of low dam. Multistep or zone method of design of gravity dam. Strip method of design of high dams. Joints, keys and water stops. Openings in dams. Galleries.	6	12	1,2,3,4,5,6	CO5	PSO4			
6	Spillways. Essential requirements. Required spillway capacity. Component parts of a spillway. Various types of spillways. Energy dissipation below spillway. Characteristics of a hydraulic jump. Location of hydraulic jump. Measure adopted for dissipation of energy. Stilling basins. Bucket type energy dissipaters. Spillway crests gates. Visvesvaraya gates.	6	12	1,2,3,4,5	CO6	PSO4			
7	Diversion headworks. Location of diversion headworks. Ideal site for a diversion head works. Layout of diversion headworks. Types of weirs. Relative advantages and disadvantages of weirs and barrages. Theories of subsurface flow. Bligh's Creep theory. Lane's weighted creep theory. Potential flow theory. Critical gradient. Khosla's theory. Khosla's solution for a horizontal floor. Khosla's solution for a composite floor. Impervious floor with an intermediate pile.	6	12	1,2,3,4,5,6	CO7	PSO4			

	Impervious floor with a downstream pile. Impervious floor with an upstream pile. Exit gradient corrections to superposed values of pressures. Location of hydraulic jump. Water surface profiles. Suction pressure in hydraulic jump through scour due to surface flow.								
8	Introduction, Requirements of a good distribution system, Arrangement of distribution pipes & other accessories, Layouts of distribution network, Methods of distribution, Pressures in the distribution system, Systems of supply, Design for fixing the sizes of pipes of a simple distribution system, Analysis of complex pipe networks	6	12	1,2,3,4,5,6	CO8	PSO4			

Reference Books

1.	Arora, K. R. “Irrigation, Water Power and Water Resources Engineering”. Standard Publishers Distributors, New Delhi.
2.	Creger, W. P., Justin, J. D. and Hind, S. J. “Engineering for Dams Vols. I, II & III”. Wiley Eastern Pvt. Ltd., New Delhi.
3.	Design for Small Dams – U.S.B.R.
4.	Garg, S. K. “Irrigation Engineering and Hydraulic Structures”. Khanna Publishers, Delhi.
5.	Kushalani, K. B. “Irrigation Engineering: Practice and Design Vol. I to VII”. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
6.	Linsley, R. K. and Franzini, J. E. “Water Resources Engineering”. McGraw Hill International.
7.	Modi, P. N. “Irrigation Water Resources and Water Power Engineering”. Standard Book House, Delhi.
8.	Varshneya, R. S., Gupta, S. C. and Gupta, R. L. “Theory and Design of irrigation structures”. Nemchand and Bros., Roorkee.
9.	Garg, S. K. “Water Supply Engineering”. Khanna Publishers, Delhi.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1705L : Laboratory Practical**	**Credits / Hours per week**	**2P**
Semester	**I**	Year of Introduction: 1991 Year of Syllabus Revision: 2020	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva		

No.	Experiment	Contact Hours	Course Code	BT Level	CO	PSO
1	Area-Elevation Capacity Curve	1	1705L	1,2,3,4	CO2	PSO4
2	Zones Of Storage In Reservoir	1	1705L	1,2,3,4	CO2	PSO4
3	Topographic Factor For Selection of Dam	1	1705L	1,2,3,4	CO3	PSO4
4	Over-Flow & Non-Over Flow Dam	1	1705L	1,2,3,4	CO3	PSO4
5	Arch & Butters Dam	1	1705L	1,2,3,4	CO3	PSO4
6	Homogeneous Earth Dam	1	1705L	1,2,3,4	CO4	PSO4
7	Zoned Earth Dam	1	1705L	1,2,3,4	CO4	PSO4
8	Diaphragm Earth Dam	1	1705L	1,2,3,4	CO4	PSO4
9	Details of Rock- Toe & Toe-Dam	1	1705L	1,2,3,4	CO4	PSO4
10	Components of Gravity Dam	1	1705L	1,2,3,4	CO5	PSO4
11	Middle Third Rule	1	1705L	1,2,3,4	CO5	PSO4

12	Elementary Profile	1	1705L	1,2,3,4	CO5	PSO4
13	Practical Profile	1	1705L	1,2,3,4	CO5	PSO4
14	Vertical Drop Weir	1	1705L	1,2,3,4	CO6	PSO4
15	Concrete Sloping Weir	1	1705L	1,2,3,4	CO6	PSO4
16	Straight Drop Spillway	1	1705L	1,2,3,4	CO6	PSO4
17	Ogee Spillway	1	1705L	1,2,3,4	CO6	PSO4
18	Chute Spillway	1	1705L	1,2,3,4	CO6	PSO4
19	Side Channel Spillway	1	1705L	1,2,3,4	CO6	PSO4
20	Shaft Spillway	1	1705L	1,2,3,4	CO6	PSO4
21	Volute Siphon Spillway	1	1705L	1,2,3,4	CO6	PSO4
22	Locations Of Hydraulic Jumps Case-I JHC & TWRC Coincide Throughout Case-II TWRC Always Lower Than JHC Case-III TWRC Always Higher Than JHC Case-IV TWRC Lower Than JHC At Low Discharges & Higher At High Discharge Case- V TWRC Higher Than JHC At Low Discharge But Lower At High Discharge	4	1705L	1,2,3,4	CO6	PSO4
23	Layout of Diversion Head Works	1	1705L	1,2,3,4	CO7	PSO4

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**~~Core~~ / Elective ~~/ Foundation~~** **WRE1706 : ELECTIVE I (A) DESING OF IRRIGATION DISTRIBUTION SYSTEM**	**Credits / Hours per week**	**3L + 1T**
Semester	**I**	Year of Introduction : 1991 Year of Syllabus Revision : 2020	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1702

CO1 To understand basic terminologies & diagrams of irrigation distribution systems

CO2 To design unlined canals using various theories

CO3 To familiarized with sediment & carry out its estimation using different equations

CO4 To design lined canals using various theories

CO5 To estimate water requirement of crops & prepare L section of canal

CO6 To understand various canal regulation structure along with their design

CO7 To emphasis various C.D. works with respect to different levels & design aqueduct with their drawing

CO8 To study various canal falls & outlet including design & also to understand various flow measuring devices

Unit No.	Topic	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employa	Relevance to Local	Relation to Gender

							bility (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	(L)/ National (N)/ Regional (R)/Global (G)	(G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Irrigation canals, Classification and types, Irrigation distribution network, Main canal, Branch canal, Distributary, Minor and water courses, Command areas, Canal alignment, Canals in cutting, full embankment and partial cutting and embankment, Balancing depth of cut, Elements of canal cross section	6	12	1,2,3	CO1	PSO4	Emp/ Ent/SD	L/N/R/G	ES
2	Unlined canals : Non-silting and non-scouring velocity, Kennedy's silt theory, Lacey's regime silt theory, Regime conditions regime equations, Limitations, Design procedures	6	12	1,2,3,4	CO2	PSO4			
3	Concepts of sediment transport, bed load and suspended load, Meyer Peter's and Einstein's equations, Tractive force theory	6	12	1,2	CO3	PSO4			
4	Lined canals : Necessity of canal lining, Types of lining, Economics of canal lining, Selection of lining, Methods of construction, Design of lined canals	6	12	1,2,3,4	CO4	PSO4			
5	Canal capacity : Water requirements by crops, Duty delta concepts, Intensity of irrigation capacity factor, Kor watering etc., Design of network, Longitudinal section, Full supply discharge, Schedule of area and channel dimensions, Concept of AIDO	6	12	1,2,3	CO5	PSO4			
6	Canal structures: Types of structures, Regulation works, Head regulators and cross regulators, Canal escapes functions and design principles	8	14	1,2,3,4	CO6	PSO4			

7	Cross-drainage works, Aqueduct, Syphon, Super passage, Level crossing, Selection and design principles	6	12	1,2,3,4	CO7	PSO4			
8	Canal falls, Necessity and location of canal falls, Various types, roughening devices used in canal falls, Canal outlets, Types of outlet, Criteria's for judging the performance of outlets	8	14	1,2,3,4	CO8	PSO4			

Reference Books

1.	Theory and Design of Irrigation Structures – R. S. Varshney, Gupta and Gupta, Nem chand and Bros., Roorkee
2.	Irrigation and Water Engineering – Punmia and Pando, B. B. Lal – Standard Publishers distributors, Delhi
3.	Fundamentals of Irrigation Engineering – Bharat Singh – Nem chand and bros., Roorkee
4.	Irrigation Engineering and Hydraulics Structures – S.K.Garg
5.	Text book of Irrigation Engineering and Hydraulic Structures – R.K.Sharma, Oxford and ` IBK Publishing house, New Delhi

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**~~Core~~ / Elective ~~/ Foundation~~** **WRE1706L : Laboratory Practical**	**Credits / Hours per week**	**2P**
Semester	**I**	Year of Introduction: 1991 Year of Syllabus Revision: 2020	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva		

No.	**Experiment**	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Overview of canal and works	5	1706L	1,2,3,4	CO1 CO3 CO6 CO7 CO8	PSO4
2	Cross-section of unlined and lined canal	6	1706L	1,2,3,4	CO2 CO4	PSO4
3	Longitudinal section of a canal	5	1706L	1,2,3,4	CO5	PSO4
4	Design of an aqueduct	5	1706L	1,2,3,4	CO7	PSO4
5	Canal fall	5	1706L	1,2,3,4	CO8	PSO4

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1707 : IRRIGATION ENGINEERING – I**	**Credits / Hours per week**	**3L + 1T**
Semester	**I**	Year of Introduction : 1991 Year of Syllabus Revision : 2020	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1707

CO1 To understand various types of surface irrigation systems & its applicability

CO2 To understand various pressurized irrigation system, its applicability and advantages

CO3 To understand basic concept of evaporation and transpiration and its measurement

CO4 To determine on farm irrigation efficiencies to evaluate the system

CO5 To be able to determine referee crop evapotranspiration using various methods and use of software to determine the same

CO6 To be able to determine crop coefficient for determination of crop evapotranspiration

CO7 To be able to understand seasonal crop water requirement & irrigation scheduling

CO8 To be familiar with various types of devices used for flow measurement in open channels

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability	**Relevance to** Local (L)/	**Relation to** Gender (G),

							(Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	National (N)/ Regional (R)/Global (G)	Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Water application methods : Criteria for selecting water application methods, Surface irrigation methods : border irrigation, Straight and contour borders, Border specifications and stream size, Basin irrigation, Check basin types, Adaptability and basin considerations, Size and shape, Furrow irrigation, Furrow types, Adaptability and characteristics, Straight furrows, Contour furrows, Corrugation irrigation	6	12	1,2	CO1	PSO3 PSO5	Emp/ Ent/SD	L/N/R/G	ES
2	Sub irrigation method : Concept and adaptability, Sprinkler irrigation, Adaptability, Limitations, Sprinkler types, Components of sprinkler system, Drip irrigation, Adaptability, Limitations Drip types, Components of drip system	6	12	1,2	CO2	PSO3 PSO5			
3	Rooting characteristics and moisture use of crops : Evaporation, Transpiration and consumptive use, Measurement of evapotranspiration - (i) Lysimeter experiment, (ii) Field experimental plots, (iii) Soil moisture depletion studies, (iv) Water balance method	6	12	1,2,3	CO3	PSO3 PSO5			
4	Irrigation efficiencies : Efficiencies as per ICID, Water conveyance efficiency, Water application efficiency, Water storage efficiency, Water distribution efficiency, Water use efficiency, Field water use efficiency, Project efficiency, Operational efficiency, Economic efficiency, Water requirement efficiency, Distribution uniformity, Deep percolation ratio and tail water ratio	6	12	1,2,3,4,5,6	CO4	PSO3 PSO5			

5	Estimating reference evapotranspiration from climatological data FAO recommended : (i) Blaney criddle method, (ii) Radiation method, (iii) Penman method, (iv) Modified Penman method, (v) Pan evaporation method and various other methods of estimating potential evapotranspiration. Introduction to CROPWAT, ETo calculator, WEAP software and its applications.	8	14	1,2,3,4	CO5	PSO3 PSO5			
6	Introduction and procedure to calculate crop evapotranspiration (ETc), Crop coefficient approach, Determine single crop coefficient Kc, Kc for different crops for different growth stages, Determining maximum evapotranspiration.	6	12	1,2,3,4	CO6	PSO3 PSO5			
7	Concept of field water balance, Effective rainfall, Ground water contribution and other factors, Net irrigation requirement, Gross irrigation requirement, Estimation of seasonal water requirement using farming practice as Full irrigation, Two irrigation and Rainfed irrigation. Determination of irrigation scheduling using farming practice as Full irrigation, Two irrigation and Rainfed irrigation	8	14	1,2,3,4	CO7	PSO3 PSO5			
8	Flow Measurement, Hydraulic Principles of flow measurements, Factors governing flume selection, Parshall flume, location criteria, cut throat flume. Types of long throated flumes, General equations for rectangular control sections, modular limit, Repogale flume, IT flume. canal flow measurement, Types of metering flumes, Venturi flume and standing wave flume	6	12	1,2,3,4	CO8	PSO3 PSO5			

Reference Books

1.	Design and Operation of Farm Irrigation systems – M.E. Jensen, ASAE Monograph No.3, A.S.A.E. Michigan
2.	Irrigation – Theory and Practice – A. M. Michael, Vikas Publishing House, New Delhi
3.	Irrigation Principles and Practices – V. E. Hansen, C. W. Israelsen and G. E. Stringham, John Wiley and Sons, New York
4.	Advances in Irrigation, Vol. 2 – Daniel Hillel, Academic Press, New York
5.	Surface Irrigation, Theory and Practice – W. R. Walker and G. V. Skogerboe, Prentice Hall Inc., New Jersy
6.	Guidelines for Predicting crop water requirements – J. Doorenbos and W. O. Pruitt Irrig. Drain Pap. 24, FAO, Rome

7.	Yield Response to water – J. Doorenbos and A. H. Kassam Irrig. Drain Pap. 33, FAO, Rome
8.	Crop Evapotranspiration : Guidelines for Computing Crop Requirements, Irrigation and Drainage, Paper No.-56, FAO Rome, Italy – Allen, R. G. Pereila, L.S. Rase, D. Smith, M, (1998)
9.	http://www.fao.org/Land-Water/databases and software
10.	https://www.weap21.org

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1707L : Laboratory Practical**	**Credits / Hours per week**	**2P**
Semester	**I**	Year of Introduction: 1991 Year of Syllabus Revision: 2020	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva		

No.	**Experiment**	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Demonstration of Border Irrigation System	02	1707L	1,2,3	CO1	PSO5
2	Demonstration of Basin Irrigation System	02	1707L	1,2,3	CO1	PSO5
3	Demonstration of Furrow Irrigation System	02	1707L	1,2,3	CO1	PSO5
4	Demonstration of Drip Irrigation System	02	1707L	1,2,3	CO2	PSO5
5	Demonstration of Sprinkler Irrigation System	02	1707L	1,2,3	CO2	PSO5
6	Determination of ETo by Pan Evaporation	03	1707L	1,2,3,4	CO5	PSO5
7	Hands on practice on CROPWAT	03	1707L	1,2,3,4	CO5	PSO5
8	Demonstration of ETo Calculator	03	1707L	1,2,3,4	CO5	PSO5
9	Demonstration of WEAP	03	1707L	1,2,3,4	CO5	PSO5
10	Discharge Measurement by Parshall Flumes	02	1707L	1,2,3,4	CO8	PSO5
11	Discharge Measurement by Cut-Throat Flumes	02	1707L	1,2,3,4	CO8	PSO5

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

F.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1704 : DESIGN PROJECT (WATER RESOURCES ENGINEERIG)**	**Credits / Hours per week**	**5P**
Semester	**I**	Year of Introduction : 1991 Year of Syllabus Revision :	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1704

CO1 The students will be able to carry out a project and also to document in form of a report based on the work. They are also encouraged to present using latest techniques enabling them to improve their presentation.

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional

									Ethics (PE)
1	Analysis, Design, computer Applications, care studies, feasibility study or state of the Art study on any topic related to Water Resources Engineering. A project report is to be prepared and viva voce will be based on the project work done by the students.	52	100	1,2,3,4,5,6	CO1	PSO3 PSO4 PSO5	Emp/ Ent/SD	L/N/R/G	ES, HV, PE

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Civil Engineering**	**Academic Year**	**2019-20**

S.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **CVL1810: TRANSPORTATION ENGINEERING II**	**Credits / Hours per week**	**04 Hr/week**
Semester	**II**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials (03 Lect. + 01 Tut)		

Course Outcome (CO) CVL1810

CO1 Understanding the importance of role of Transportation Engineering
CO2 Understanding and learning the various Traffic Engineering parameters
CO3 Understand and learn various highway construction materials characteristics and evaluation of their properties
CO4 Design of Highway geometrics and Highway Pavement
CO5 Understand and Learn the construction,maintenance and repair of Highways
CO6 Understanding and learn the economic and financial viability of Highways

Unit No.	Topic	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional (R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	**Highway Development and Planning** Role of Roads in the development of nation, Planning	7	10	2,3	1	PSO1	EMP/SD	L/R/N	ES/PE

	concepts, Necessity, Road development Plan of India, Role of various organization, Master Plan, Financing, organizations, role played by IRC, CRRI, HRB etc in road development								
2	**Geometric Design** Geometric Designs of Highways and Roads in Urban Areas, Design of OSD, SSD, Super elevation, Horizontal and Vertical curve, transition curve Classification and consideration in fixing alignment of roads	6	18	2,3,4	4	PSO1, PSO2			
3	**Traffic Engineering** Introduction of Traffic Engineering, Traffic Volume, density, Capacity, Factors affecting PCU value, Surveys and design and control measures for traffic, intersections design and problem	6	16	2,3,4	2,4	PSO1, PSO2			
4	**Highway Material** Materials (Soil, Aggregate and Bitumen) for road construction their properties	5	08	2,3	3	PSO1			
5	**Pavement Design** Introduction of Pavement design, Types and Factors affecting the pavement performance, IRC guidelines for design of Flexible and Rigid Pavement	7	20	2,3,4	3,4	PSO1, PSO2			
6	**Highway Construction** Road construction methods of low Cost Road, Intermediate road (WBM and WMM) ,Bituminous pavement Construction, Highway Drainage	7	18	2,3	5	PSO1			
7	**Highway Maintenance** Routine and periodic maintenance of Highways	2	4	2,3	5	PSO1			
8	**Highway Economics and Finance** Introduction, Highway costs, Highway finance-methods	2	6	2,3,4	6	PSO1, PSO2			

Reference Books

1. Khanna, Justo &Veeraghvan, Highway Engineering, Pub: NemChand & Bros, Roorke
2. Chakroborty& Das, Principles of TransportationEngineering, Pub: PHI learning Pvt. Ltd.
3. S. K. Sharma, Principles Practice and Design of hihway Engineering, S Chand Pvt. LTd.
4. Prithvi Singh Kandhal, Bituminous Road Construction in India, Pub: PHI learning Pvt. Ltd.
5. Principles of pavement design: by Yoder and Witezak (Second edition)- Publisher: john Wiley and sons.

6. Pavements and surfacing for Highway and airports: by Michel Sargious (1975) – Publisher: Applied science publishers ltd.
7. Pavement management systems: by Hose and Hudson- Publisher: McGraw Hill
8. Thickness design – asphalt pavement structures for Highway and streets – Publisher: Asphalt Institute (US)
9. Khanna and Arora, Airport Planning and design Pub. Nemchand& Sons Roorkee
10. Sehgal and Bhanot, A Text book of Highway & Airport Engg. S.Chand and Co.
11. Horonjeiff,Mckelvy, Sproule& Young, The planning and design of Airport –Pub. McGraw Hill Co.
12. IRC – Hand book of Quality control for construct ion of Roads and runways
13. MORT&H (5TH Revision) – Specifications for Road and Bridges
14. Codes-IRC-37,IRC-58, IRC-SP-17

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Department of Applied Physics**	**Academic Year**	**2019-20**

S.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **CVL1810L: Transportation Engineering II - Practical and Termwork**	**Credits / Hours per week**	**02**
Semester	**II**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**
Mode of Transaction		Practical and Termwork		

No.	**Practical and Termwork**		**Course Code**	**BT Level**	**CO**	**PSO**
1	Testing and evaluating the various properties of Road Aggregate: Crushing Test, Impact, Shape Test, Los Angles Abrasion test, Sp. Gravity , Bulk Density and Water Absorption test		CVL 1810L	3,5	3, 4	PSO1, PSO2
2	Testing and evaluating the various properties of Road Bitumen: Penetration Test, Softening Test, Absolute viscosity test, Kinematic viscosity test, Ductility test		CVL 1810L	3,5	3,4	PSO1, PSO2
3	Quality control test of Bituminous Mix Bitumen content test of Bitumen Mix		CVL 1810L	3,5	4,5	PSO1, PSO2
5	Field survey and analysis of Traffic Volume count		CVL 1810L	3,4	2	PSO1, PSO2

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2019-20**

S.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1802 : IRRIGATION ENGINEERING - II**	**Credits / Hours per week**	**3L + 1T**
Semester	**II**	Year of Introduction : 1991 Year of Syllabus Revision :	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1802

CO1 To study various phases of surface irrigation

CO2 To be able to design and evaluate various components of border irrigation system

CO3 Understanding various components of basin irrigation system, its design and evaluation

CO4 To be familiar with furrow irrigation design & evaluate its components

CO5 Understanding hydraulics of pipe and various equations used for head loss

CO6 To be able to determine head loss in multiple outlet pipes

CO7 To be able to design & evaluate sprinkler irrigation system

CO8 To be able to prepare layout design & evaluation of various components of drip irrigation system

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/	**Relevance to** Local (L)/ National	**Relation to** Gender (G), Environ

							Entrepreneurship (Ent)/ Skill Development (SD)	(N)/ Regional (R)/Global (G)	ment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Levis Milne equation, Volume balance field design, Design objectives, Advance phase, Wetting, Depletion phase, Recession phase	4	9	1,2,3	CO1	PSO5	Emp/ Ent/SD	L/N/R/G	ES
2	Design of Border irrigation system, Evaluation of border irrigation system	7	13	1,2,3,4,5	CO2	PSO5			
3	Design of basin irrigation system, Evaluation of basin irrigation system	7	13	1,2,3,4,5	CO3	PSO5			
4	Design of furrow irrigation system, Evaluation of furrow irrigation system	7	13	1,2,3,4,5	CO4	PSO5			
5	Hydraulics of pipe systems, Fundamental flow equations, Darcy-Weisbach equation, Scobey equation and Hagen Williams equation	7	13	1,2,3	CO5	PSO5			
6	Headloss in pipes with multiple, equally spaced outlets	6	12	1,2,3	CO6	PSO5			
7	Design of solid set sprinkler system, Evaluation of sprinkler irrigation system distribution uniformity, Coefficient of uniformity	8	15	1,2,3,4,5	CO7	PSO5			
8	Design of drip irrigation system, Evaluation of drip irrigation system	6	12	1,2,3,4,5	CO8	PSO5			

Reference Books

1. Design and operation of Farm Irrigation systems - M. E. Jensen ASAE Monograph No.3, ASAE, Michigan
2. Surface Irrigation Theory and Practice - W. R. Walker and G. V. Skogerboe, Prentice Hall Inc., New Jersey

3.	Farm Irrigation system Evaluation, A guide for Management - J. L. Merriam and Jack Keller, Utah State University, Logan

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2019-20**

S.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1802L : Laboratory Practical**	**Credits / Hours per week**	**4P**
Semester	**II**	Year of Introduction: Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva	**PSO7 is common for all experiments**	

No.	**Experiment**	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Analysis of advance, recession and depletion phases	4	1802L	1,2,3	CO1	PSO5
2	Design of border irrigation system	5	1802L	1,2,3,4	CO2	PSO5
3	Design of basin irrigation system	5	1802L	1,2,3,4	CO3	PSO5
4	Design of furrow irrigation system	5	1802L	1,2,3,4	CO4	PSO5
5	Layout and design of drip irrigation system	5	1802L	1,2,3,4	CO8	PSO5
6	Layout and design of sprinkler irrigation system	5	1802L	1,2,3,4	CO7	PSO5
7	Evaluation of border irrigation system	5	1802L	1,2,3, 4,5	CO2	PSO5
8	Evaluation of drip irrigation system	5	1802L	1,2,3, 4,5	CO8	PSO5
9	Evaluation of sprinkler irrigation system	5	1802L	1,2,3, 4,5	CO7	PSO5
10	Determination of head loss in pipe flow	4	1802L	1,2,3	CO5	PSO5

11	Determination of head loss in multiple outlet pipes	4	1802L	1,2,3	CO6	PSO5

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

S.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**~~Core~~ / Elective ~~/ Foundation~~** **WRE1803 : ELECTIVE II (A) DRAINAGE ENGINEERING OF IRRIGATED AGRICULTURE**	**Credits / Hours per week**	**3L + 1T**
Semester	**II**	Year of Introduction : 1991 Year of Syllabus Revision :	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1803

CO1 To understand the concept of drainage and its needs and properties

CO2 To be able to understand various types of drainage system & survey & investigations of the same

CO3 To able to design surface drainage systems & its components

CO4 To be able to design sub surface drainage system and its components

CO5 To be familiar with special methods of drainage

CO6 To be familiar with problems in drainage

CO7 To understand problems causes & preventive measures related to drainage

CO8 To understand preventive measures for saline soils

Unit No.	Topic	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employa	Relevance to Local	Relation to Gender

							bility (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	(L)/ National (N)/ Regional (R)/Global (G)	(G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Importance and benefits of drainage, Interrelationship of irrigation and drainage, Soil properties influencing drainage, Statics and dynamics of soil water, Hydraulic conductivity and its measurement in the laboratory and the field	6	12	1,2,3,4	CO1	PSO5	Emp/ Ent/SD	L/N/R/G	ES
2	Types of drainage, Surface and subsurface, Drainage surveys and investigations, Types of land requiring drainage and criteria, Planning a field drainage system, Fundamentals of seepage analysis	6	12	1,2,3,4	CO2	PSO5			
3	Surface drainage, Type and design of open ditches	8	14	1,2,3,4	CO3	PSO5			
4	Subsurface Drainage : Theory of subsurface drainage, General solution to drainage flow problems, Flow to drains in homogeneous, Heterogeneous and anisotropic soils, Design of filters, Subsurface drainage design, Types of systems, Depth and spacing design criteria	8	14	1,2,3,4	CO4	PSO5			
5	Maintenance of water table, Special methods of drainage e.g. Vertical drainage, Mole drains, Drainage wells Recycling of drainage water	6	12	1,2,3	CO5	PSO5			
6	Problems related to drainage and salinity in irrigated agriculture, Causes of salt accumulation	6	12	1,2,3	CO6	PSO5			
7	Water logging, Soil salinity, Salt balance, Leaching methods	6	12	1,2,3,4	CO7	PSO5			
8	Reclamation and management of salt affected soils, Reclamation of	6	12	1,2,3	CO8	PSO5			

	saline and alkaline soils, Special legal problems of reclamation								

Reference Books

1.	Drainage manual for irrigated Agriculture in India - IMTP Publication, New Delhi
2.	Drainage Engineering – Luthin
3.	Manual of Surface Drainage Engineering Vol. II - B. Z. Kinori and J. Mevorach - Elseveir
4.	Drainage for Agriculture - J. V. Schilfgaarde - American Society of Agronomy

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

S.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**~~Core~~ / Elective ~~/ Foundation~~** **WRE1803L : Laboratory Practical**	**Credits / Hours per week**	**2P**
Semester	**II**	Year of Introduction: 1991 Year of Syllabus Revision:	**Maximum Marks / Grade**	**50**
Mode of Transaction		Laboratory Experiments, discussion and viva		

No.	**Experiment**	**Contact Hours**	**Course Code**	**BT Level**	**CO**	**PSO**
1	Field visit to show agriculture surface drainage system	4	1803L	1,2,3	CO3	PSO5
2	Determination of Runoff by US SCS CN Method	4	1803L	1,2,3	CO3	PSO5
3	Field visit to show agriculture sub surface drainage system	4	1803L	1,2,3	CO4	PSO5
4	Field visit to show water logged area, and their problems	4	1803L	1,2,3	CO7	PSO5
5	Field visit to show salt affected areas and their reclamation	5	1803L	1,2,3	CO7	PSO5
6	Determination of Leaching Requirements	5	1803L	1,2,3	CO7	PSO5

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021-22**

S.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1806 : IRRIGATION MANAGEMENT**	**Credits / Hours per week**	**3L + 1T**
Semester	**II**	Year of Introduction : 1991 Year of Syllabus Revision : 2020	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1806

CO1 To familiar with various traditional approach of irrigation management
CO2 To understand participatory approach in irrigation management
CO3 To understand management & need of water user association
CO4 To emphasis on the process of training to WUA/WUC, agency officials including their monitoring performance
CO5 To understand various traditional water supply systems & develop RWS scheduling
CO6 To familiar with traditional tank management system with their case studies
CO7 To familiarized with lift irrigation system & its design for water allocation
CO8 To understand integrated approach in water resources management

Unit No.	**Topic**	**Contact Hours**	**Weightage (%)**	**BT Level**	**CO**	**PSO**	**Elements of** Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	**Relevance to** Local (L)/ National (N)/ Regional (R)/Global (G)	**Relation to** Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)

1	Goals of irrigation management, Problems in irrigation management, Social scientists and irrigation engineers, joint involvement in management of irrigation systems. Traditional irrigation management	6	12	1,2	CO1	PSO3 PSO5	Emp/ Ent/SD	L/N/R/G	G, ES, HV, PE
2	Participatory Irrigation management, Concept of PIM, Need of PIM, Benefits of PIM, Objectives of PIM, Status of PIM in India and Gujarat, Impacts of PIM, Approaches to PIM, Constraints in implementation on PIM, Support for PIM in India	6	12	1,2,3	CO2	PSO3 PSO5			
3	Water user's association / cooperatives. Pre-requites for sustainable WUA/WUC. Types of farmer's organization. Hierarchy of irrigation dept. and WUA/WUC. Constraints to farmer's participation. Incentives for implementation of PIM. Organizing steps for transfer of management to users. Steps of rehabilitation and maintenance work carried out by WUA/ WUC. Allocation of water. Steps for charging of water within the organization. Agreement of MOU between WUA/ WUC and Government. Formation, rights and functions of each committee. Rights and functions of irrigation department. Raising of funds and investment by WUA/ WUC	8	14	1,2,3	CO3	PSO3 PSO5			
4	Training of PIM to WUA/ WUC. Organizers for implementing PIM. Designing a capacity building program for PIM. Role of trainer. Conducting training programme. Training of discharge measurement. Walk through survey/maintenance survey. Crop assessments and water charges collection. Training to agency officials. Workshops on agricultural production practices. Monitoring performances of WUA/ WUC, Impacts of PIM on irrigation efficiency & equity, Impact of PIM on agriculture	8	14	1,2,3	CO4	PSO3 PSO5			
5	Rotational Water Supply System. Traditional system, Sejpali, Warabandhi, Vara-Varam, RWS, Principles of RWS system, Preparation of RWS.	6	12	1,2,3	CO5	PSO3 PSO5			
6	Tank management systems, Organisation structure, Maintenance schedule, Problems involved, Organisation of rotational schedule, Case studies	6	12	1,2,3	CO6	PSO3 PSO5			
7	Management of lift irrigation system, System design for water allocation, Role of water users' organization in management of lift irrigation systems, Economic appraisal of lift irrigation scheme.	6	12	1,2,3	CO7	PSO3 PSO5			
8	Integrated water resources management. Principles, Key issues in IWRM. Establishing basin management system. Roles and types of basin organizations. Finance. Involving stakeholders. Strategic long term planning. Basin action plans.	6	12	1,2,3	CO8	PSO3 PSO5			

Reference Books	
1.	Barik, B. C. “Course Report on Partipatory Irrigation Management”. WALMI, Anand
2.	Guide for Preparation of Plans of Operation and Maintenance of Irrigation Systems in India – Indian National Committee on Irrigation and Drainage, INCID, New Delhi.
3.	Guidelines for “Hariyali” Watershed Development Programme. Ministry of Rural Development, Govt. of India.
4.	Gujarat Government Orders on Participatory Irrigation Management, Development Support Centre, Ahmedabad
5.	Impact of Participatory Irrigation Management Training Programme. WALMI, Anand
6.	Irrigation Management Committees NMWP Guidelines and Implantations for Implementation Indo-Dutch Training, Production Management Unit.
7.	Hooja, R. “A Strategy for training for PIM in India, Working paper, Indianpim.
8.	Maloney, C. and K.V. Raju., “Economic aspect of PIM”, Additional reading on farmers’ organizations for irrigation management, WAPCOS, New Delhi.
9.	Murray, H., Lashri B. and Memon, Y. “How to establish water users association?” Practical steps for social mobilizers”, IWMI
10.	Pangare, G.A. “Scaling up PIM in India”. Indian Network on PIM, New Delhi.
11.	A Handbook for Integrated Water Resources Management in Basins, Published 2009 by the Global Water Partnership (GWP) and the International Network of Basin Organizations (INBO).
12.	Puskar Jena, Mamata Swain, “Participatory Irrigation Management in India”, Best Publishing House
13.	UU.S. Gautam, A. K. Singh, A. K. Sikka, “Participatory Irrigation Management”, Agrotech Publishing Agency

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2019-20**

S.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1804L : Laboratory Practical**	**Credits / Hours per week**	**2P**
Semester	**II**	Year of Introduction : 1991 Year of Syllabus Revision : 2010	**Maximum Marks / Grade**	**50**
Mode of Transaction		Field visit, discussion and viva		

No.	Experiment	Contact Hours	Course Code	BT Level	CO	PSO
1	Field visit to Water User's Association to discuss rights and functions of each committee of WUA and PIM	5	1804	1.2.3	CO3	PSO3 PSO5
2	Field visit to co-operative societies to discuss rights and functions of PIM	5	1804	1.2.3	CO2 CO4	PSO3 PSO5
3	Preparation of RWS based on actual schedule	6	1804	1.2.3	CO5	PSO3 PSO5
4	Field visit to Tank Irrigation system and understand its components, functions and management	5	1804	1.2.3	CO6	PSO3 PSO5
5	Field visit to Lift Irrigation System and understand system design for water allocation and its management.	5	1804	1,2,3	CO7	PSO3 PSO5

Syllabus of Courses

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021 - 22**

S.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1807 : CONSTRUCTION PLANNING AND MANAGEMENT**	**Credits / Hours per week**	**3L + 1T**
Semester	**II**	Year of Introduction : 1991 Year of Syllabus Revision : 2021	**Maximum Marks / Grade**	**100**
Mode of Transaction		Lectures and Tutorials		

Course Outcome (CO) WRE1807

CO1 To prepare bar chart, mile stone chart & to carry out network analysis using Critical Path Method

CO2 To carry out PERT analysis, resources allocation & crashing for different projects

CO3 To understand basic fundamentals of vehicles used for earth moving

CO4 To familiarized with various hauling equipments

CO5 To familiar with various excavation & compacting equipments

CO6 To familiarized with pumping & drilling equipments

CO7 To understand different methods of depreciation & to estimate owning & operating cost of different equipment

CO8 To demonstration and to provide Hands-on Practice of MS Project.

Unit No.	Topic	Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability	Relevance to Local (L)/	Relation to Gender (G),

							(Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	National (N)/ Regional (R)/Global (G)	Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Construction planning : Necessity, Methods of planning, Fundamentals terms-events, Activities, Bar charts, Critical path method, Developing critical path network, Statement of work, Workbreak-down structure.	7	13.5	1,2,3,4,5	CO1	PSO1 PSO2 PSO4	Emp/ Ent/SD	L/N/R/G	HV, PE
2	Programme evaluation and review technique (PERT) construction scheduling, Construction cost control, Construction management cost optimisation, Crashing, Resource allocation, Resource smoothening	7	13.5	1,2,3,4,5	CO2	PSO1 PSO2 PSO4			
3	Engineering fundamentals : Rolling resistance, Effect of grade drawbar pull, Rimpull, Acceleration, Swell and shrinkage of soils	7	13.5	1,2,3,4,5	CO3	PSO1 PSO2 PSO4			
4	Tractors and related equipment : Tractors-types, Performance & gradability, Bulldozers types and output tractor shovels rippers, Land cleaning equipment scrapers, Cycle times, Types and output drag line, Clam shells, Hoes, Trenching machines, Farm equipment tractors, ploughs, discharrows	7	13.5	1,2,3,4	CO4	PSO1 PSO2 PSO4			
5	Other construction equipment : Power shovels - types and size, Selection, Optimum depth of cut, Output, Trucks and wagons, Types and capacities, Balancing capacities of excavators, Compacting equipment: Rollers, their suitability for different operations, Belt	6	11.5	1,2,3	CO5	PSO1 PSO2 PSO4			

	conveyers component & power required								
6	Pumping equipment, Types of pumps used in construction work selection, Drilling and blasting of rocks, Drill bits, Selection of drilling patterns, Rates of drilling use of compressed air compression in drilling, Concrete mixers, types and sizes	4	7.5	1,2,3	CO6	PSO1 PSO2 PSO4			
7	Selection of construction equipment : Methods of depreciation cost of owning and operation of equipment cost of maintenance and repairs of construction equipment, Financial management, Discounted cash flow analysis, Present worth	7	13.5	1,2,3	CO7	PSO1 PSO2 PSO4			
8	Demonstration of MS Project. Hands-on Practice of MS Project.	7	13.5						

Reference Books

1.	Construction Planning, Equipment and Methods - R.C.Peurifoy
2.	Construction equipment, Planning and applications - Mahesh Verma
3.	PERT & CPM - L. Srinath
4.	Critical path methods inconstruction practice – Antia
5.	Farm Machinery and Equipment - Smith nd Wilkes
6.	Farm Machinery – Gulfin
7.	Project Management - Kerzner - Van Nostrand Reinhold Co.

	The Maharaja Sayajirao University of Baroda **Faculty Technology and Engineering** **Water Resources Engineering and Management Institute**	**Academic Year**	**2021 - 22**

S.S. OF B.E.-IV (CIVIL – IRRIGATION WATER MANAGEMENT)

Year	**IV**	**Core / ~~Elective / Foundation~~** **WRE1807L : Laboratory Practical**	**Credits / Hours per week**	**3P**
Semester	**II**	Year of Introduction : 1991 Year of Syllabus Revision :2021	**Maximum Marks / Grade**	**50**
Mode of Transaction		Field visit,drawing,Analysis, discussion and viva		

No.	Experiment	Contact Hours	Course Code	BT Level	CO	PSO
1	Demonstration of Onsite Application of various earth moving vehicle	4	1807L	1,2,3	CO4	PSO1 PSO2
2	Demonstration of Onsite Application of various earth excavating machinery	4	1807L	1,2,3	CO5	PSO1 PSO2
3	Preparation of Gantt chart for construction of on site residential house	4	1807L	1,2,3,4	CO1	PSO1 PSO2
4	Preparation of Gantt chart for construction of Small water resources Project	4	1807L	1,2,3,4	CO1	PSO1 PSO2 PSO4
5	To carry out CPM and PERT analysis for on field project data	4	1807L	1,2,3,4	CO2	PSO1 PSO2

						PSO4
6	Determination of owing and operating cost of an equipments	4	1807L	1,2,3,4	CO7	PSO1 PSO2
7	Demonstration of MS Project	6	1807L	1,2,3	CO8	PSO1 PSO2 PSO4
8	Hands on practice of MS Project	9	1807L	1,2,3, 4,5,6	CO8	PSO1 PSO2 PSO4