University of Mumbai



No. AAMS_UGS/ICC/2022-23/\\\

CIRCULAR :-

Attention of the Principals of the Affiliated Colleges and Directors of the recognized Institutions in Faculty of Science & Technology is invited to this office circular No. UG/226 of 2016-17 dated 13rd January, 2017 relating to the revised syllabus of M.E.(Water Resources Engineering) (Sem. -1 & IV) (CBCS).

They are hereby informed that the recommendations made by the Board of Studies in Civil Engineering at its meeting held on 06th June, 2022 and subsequently passed in the Faculty and then by the Board of Deans at its meeting held on 5th July, 2022 vide item No. 6.20 (R) have been accepted by the Academic Council at its meeting held on 11th July, 2022 vide item No. 6.20 (R) and that in accordance therewith, the revised syllabus of M.E.(Water Resources Engineering) (Sem. - I to IV) (CBCS) (REV-2022 Scheme) has been brought into force with effect from the academic year 2022-23. (The circular is available on the University's website www.mu.ac.in).

MUMBAI - 400 032 20th October, 2022

(Dr. Shailendra Deolankar) I/c Registrar

To

The Principals of the Affiliated Colleges and Directors of the recognized Institutions in Faculty of Science & Technology.

A.C/6.20(R)/11/07/2022

No. AAMS_UGS/ICC/ 2022-23/ \ \ \

Copy forwarded with Compliments for information to:-

- 1) The Dean, Faculty of Science & Technology,
- 2) The Chairman, Board of Studies in Civil Engineering,
- 3) The Director, Board of Examinations and Evaluation,
- 4) The Director, Board of Students Development,
- 5) The Director, Department of Information & Communication Technology,
- 6) The Co-ordinator, MKCL.

of October, 2022

(Dr. Shailendra Deolankar) I/c Registrar



Copy for information and necessary action :-

- 1. The Deputy Registrar, College Affiliations & Development Department (CAD),
- 2. College Teachers Approval Unit (CTA),
- 3. The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Department (AEM),
- 4. The Deputy Registrar, Academic Appointments & Quality Assurance (AAQA)
- 5. The Deputy Registrar, Research Administration & Promotion Cell (RAPC),
- 6. The Deputy Registrar, Executive Authorities Section (EA) He is requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to the above circular.
- 7. The Deputy Registrar, PRO, Fort, (Publication Section),
- 8. The Deputy Registrar, Special Cell,
- 9. The Deputy Registrar, Fort Administration Department (FAD) Record Section,
- 10. The Deputy Registrar, Vidyanagari Administration Department (VAD),

Copy for information :-

- 1. The Director, Dept. of Information and Communication Technology (DICT), Vidyanagari,
 - He is requested to upload the Circular University Website
- 2. The Director of Department of Student Development (DSD),
- 3. The Director, Institute of Distance and Open Learning (IDOL Admin), Vidyanagari,
- 4. All Deputy Registrar, Examination House,
- 5. The Deputy Registrars, Finance & Accounts Section,
- 6. The Assistant Registrar, Administrative sub-Campus Thane,
- 7. The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan,
- 8. The Assistant Registrar, Ratnagiri sub-centre, Ratnagiri,
- 9. P.A to Hon'ble Vice-Chancellor,
- 10. P.A to Pro-Vice-Chancellor,
- 11. P.A to Registrar,
- 12. P.A to All Deans of all Faculties,
- 13. P.A to Finance & Account Officers, (F & A.O),
- 14. P.A to Director, Board of Examinations and Evaluation,
- 15. P.A to Director, Innovation, Incubation and Linkages,
- 16. P.A to Director, Department of Lifelong Learning and Extension (DLLE),
- 17. The Receptionist,
- 18. The Telephone Operator,

Copy with compliments for information to :-

- 19. The Secretary, MUASA
- 20. The Secretary, BUCTU.

AC – 11 July, 2022 Item No. – 6.20 (R)



University of Mumbai



O: Title of Course	M.E. (Water Resources Engineering)			
O: Eligibility	Passed B.E./B.Tech and as per the Ordinance 5134			
R: Passing Marks	45%			
No. of years/Semesters:	2 years / 4 semesters			
Level:	P.G. / U.G./ Diploma / Certificate			
Pattern:	Yearly / Semester			
Status:	New / Revised 2022			
To be implemented from Academic Year :	With effect from Academic Year : 2022-23			
	With effect from Academic Year : 2022-23			

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Dr. Suresh K. Ukarande Chairman, Board of Studies in Civil Engg.

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Dr. Suresh K. Ukarande Associate Dean, Faculty of Science and Technology University of Mumbai

Mayamda

Dr Anuradha Majumdar Dean, Faculty of Science and Technology University of Mumbai

G		Teaching Scheme (Contact			Credita Assigned					
Course	Course Name	Hours)					realts A	ssigned	l	
Code		Theo	Theory		Tut.	Theory	Pract.	Tut.	Total	
WRC 101	Advanced Fluid Mechanics	3				3			3	
WRC 102	Applied Hydrology	3				3			3	
WRPE101	Program Elective 1	3				3			3	
WRPE102	Program Elective 2	3				3			3	
WRIE101	Institute Elective 1	3				3			3	
WRL101	Program Lab-I			2			1		1	
WRSBL101	Skill Based Lab-I			4 ^{\$}			2		2	
	Total	15		06		15	03		18	
				1	Examinati	on Scheme				
				Theor	ry					
Course	Course Name	Intern	al Asse	essment	End	Exam.	Term	Prac		
Code	Course Maine	Test-	Test		Sem.	Duratio	Work	t/	Total	
		1	2	Avg	Exam	n		Orai		
						(in Hrs)				
WRC 101	Advanced Fluid Mechanics	20	20	20	80	3			100	
WRC 102	Applied Hydrology	20	20	20	80	3			100	
WRPE101	Program Elective 1	20	20	20	80	3			100	
WRPE102	Program Elective 2	20	20	20	80	3			100	
WRIE101	Institute Elective 1	20	20	20	80	3			100	
WRL101	Program Lab-I						25	25	50	
WRSBL101	Skill Based Lab-I						50	50	100	
	Total			100	400		75	75	650	

Course	Course Name	Teaching Scheme (Contact Hours)				Credits Assigned			
Couc		Theo	ory	Pract.	Tut.	Theory	Pract.	Tut.	Total
WRC 201	Water Resources Economics Planning and Management	3				3			3
WRC 202	Design of Hydraulic Structures	3				3			3
WRPE201	Program Elective 3	3				3			3
WRPE202	Program Elective 4	3				3			3
WRIE201	Institute Elective 2	3				3			3
WRL201	Program Lab-II			2			1		1
WRSBL201	Skill Based Lab-II			4 ^{\$}			2		2
	Total	15 06				15	03		18
					Examina	tion Scheme			
Course				Theo	ry				
Code	Course Name	Intern	al Ass	essment	End	Exam.	Term	Pract	Total
Coue		Test-	Test	- A wa	Sem.	Duration	Work	/ Oral	TUtal
		1	2	Avg	Exam	(in Hrs)			
WRC 201	Water Resources Economics Planning and Management	20	20	20	80	3			100
WRC 202	Design of Hydraulic Structures	20	20	20	80	3			100
WRPE201	Program Elective 3	20	20	20	80	3			100
WRPE202	Program Elective 4	20	20	20	80	3			100
WRIE201	Institute Elective 2	20	20	20	80	3			100
WRL201	Program Lab-II						25	25	50
WRSBL201	Skill Based Lab -II						50	50	100
Total 100 400					75	75	650		

Semester II

Note 1: Skill Based Lab- I and II are focused on the learning through experience. SBL shall facilitate the learner to acquire the fundamentals of practical engineering in his or her specialization in a project-oriented environment. The learning through skill-based labs can be useful in facilitating their research work and hence useful in early completion of their dissertation work.

List of Program	Electives
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Course Code	Program Elective I	Course Code	Program Elective II
WRPE1011	Applied Statistics	WRPE1021	Environmental Impact assessment
WRPE1012	Watershed Development & Management	WRPE1022	Soil Science & Agro Technology
WRPE1013	Ground Water Engineering	WRPE1023	Water shed Management
Course Code	Program Elective III	Course Code	Program Elective IV
WRPE2011	System Engineering and Its Application	WRPE2021	Integrated River Basin Management
WRPE2012	Water Power Engineering	WRPE2022	Soft Computing Techniques in Hydrology and Water Resources Engineering
WRPE2013	Advance Hydraulic Analysis and Design	WRPE2023	Advances in Irrigation Engineering

Semester-I InstituteLevelOptionalCourses(ILOC)					
Course Code	Course Name				
WRIE 1011	Product LifecycleManagement				
WRIE 1012	ReliabilityEngineering				
WRIE 1013 ManagementInformationSystem					
WRIE 1014	Design of Experiments				
WRIE 1015	OperationResearch				
WRIE1016	Cyber SecurityandLaws				
WRIE 1017	DisasterManagementandMitigationMeasures				
WRIE 1018	EnergyAuditandManagement				
WRIE 1019	Development Engineering				

Semester- II InstituteLevelOptionalCourses(ILOC)					
Course Code	Course Name				
WRIE 2021	ProjectManagement				
WRIE 2022	FinanceManagement				
WRIE 2023 EntrepreneurshipDevelopmentandManagement					
WRIE 2024	HumanResourceManagement				
WRIE 2025	ProfessionalEthicsandCSR				
WRIE 2026	ResearchMethodology				
WRIE 2027	IPRandPatenting				
WRIE 2028	DigitalBusinessManagement				
WRIE 2029	EnvironmentalManagement				

Semester III

Course Code Course Name		Teaching Scheme (Contact Hours)				Credits Assigned			
		Theory	, I	Pract.	Tut.	Theory	Pract.	Tut.	Total
WRMP301	Major Project: Dissertation -I			20			10		10
T	otal	00 20 00 10				10		10	
		Examination Scheme							
	Course Name Intern Test-1								
Course Code		Internal Assessment Er			End	Exam.	Torm	Proot/	
		Test-1	Test- 2	Avg	Sem Exa m	Durati on (in Hrs)	Work	Oral	Total
WRMP301	Major Project: Dissertation -I						100		100
T	otal					100 100			100

Online Credit Courses

Course Code	Course Name	Teach (Cont	ing Sche tact Hou	eme rs)	Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
WROCC301	Online Credit Course - I							3
WROCC301	Online Credit Course - II							3
Total					00	00	00	06

Note 2: It is mandatory to complete the Online Credit Courses (OCC) available on NPTEL / Swayam /MOOC or similar platform approved by UoM. These two courses shall be completed in any semester I or II or III, but not later end of the Semester III. University shall make a provision that credits earned with OCC- I and OCC-II shall be accounted in the third semester grade-sheet with actual names of courses. The learner shall be allowed to take up these courses from his or her institute or organisation/ industry where his / her major project is carried out. The students shall complete the courses and shall qualify the exam conducted by the respective authorities/ instructor from the platform. The fees for any such courses and the corresponding examination shall be borne by the learner.

Online Credit Course – I

The learner shall opt for the course in the domain of Research Methodology **or** Research & Publication Ethicsor IPR. The opted course shall be of 3 credits of equivalent number of weeks.

Online Credit Course –II

The learner shall opt for the course recommended by Faculty Advisor/ Project Supervisor from the institute. The opted course shall be of 3 credits of equivalent number of weeks.

Semester	IV

Course	Course Name	Teaching Scheme (Contact Hours)			9	Credits Assigned				
Code		The	ory	Pract.	Tut.	Theory	Pract.	Tut.	Total	
WRMP401	Major Project: Dissertation -II			32			16		16	
r	Fotal	32					16		16	
					Exami	nation Sch	eme			
	Course Name			Theor	y					
Course		Internal Assessment			End	Exam.		_		
Code		Test- 1	Test- 2	Avg	Sem Exa m	Duratio n (in Hrs)	Term Work	Pract/ Oral	Total	
WRMP401	Major Project: Dissertation -II						100	100	200	
r	Fotal						100	100	200	

Total Credits: 68

Note 3:The Dissertation -II submission shall not be permitted till thelearner completes all the requirements ME course.

Note 4:The contact hours for the calculation of load of the teacher for Major Project are as follows: Major Project Dissertation I and II - 02 Hour / week / student

Guidelines for Dissertation-I

Students should do literature survey and identify the problem for Dissertation and finalize in consultation with Guide/Supervisor. Students should use multiple literatures and understand the problem. Students should attempt solution to the problem by analytical/simulation/experimental methods. The solution to be validated with proper justification and compile the report in standard format. Guidelines for Assessment of Dissertation-I.

Dissertation-I should be assessed based on following points

- Quality of Literature survey and Novelty in the problem
- Clarity of Problem definition and Feasibility of problem solution
- Relevance to the specialization

• Clarity of objective and scope Dissertation-I should be assessed through a presentation by a panel of Internal examiners and external examiner appointed by the Head of the Department/Institute of respective Programme.

Guidelines for Assessment of Dissertation II

Dissertation II should be assessed based on following points:

- Quality of Literature survey and Novelty in the problem
- Clarity of Problem definition and Feasibility of problem solution
- Relevance to the specialization or current Research / Industrial trends
- Clarity of objective and scope
- Quality of work attempted or learner contribution

- Validation of results
- Quality of Written and Oral Presentation

Students should publish at least one paper based on the work in referred National/ International conference/Journal of repute.

Dissertation II should be assessed by internal and External Examiners appointed by the University of Mumbai.

SemesterI						
Course Code	Course Name	Credits				
WRC 101	Advanced Fluid Mechanics	03				

TeachingScheme							
Co	CreditsAssigned						
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total	
03			03			03	

	EvaluationScheme								
	Theory		Term Work/Practic al/Oral			Total			
InternalAssessment EndS			Duration						
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus					
Module	Content	Contact Hours			
1	Ideal fluid motion	8			
	Review of Fluid mechanics, Kinematics of fluid flow, stream functions and potential functions, Laplace equation and its solution by graphical and relaxation methods, flow nets, dynamics of fluid flow, Euler's equation, application of ideal fluid motion, Source and Sink, Free vortex flow, Source and Uniform flow, Superimposed flow patterns, Source-Sink pair, Source and Sink pair in a uniform flow, Doublet, Flow past a Rankine oval body, Magnus effect, KuttaJoukowski transformation.				
2	Laminar, Transition and Turbulent flow	10			
	Laminar Flow: Concept and characteristics of laminar flow, Navier-Stokes equations, creeping motion, approximate and exact solutions.				
	Transition flow: Concept of stability, stability theories, factors affecting transition, Rouse Index				
	Turbulent flow: Classification and characteristics of turbulent flows, statistical approach, Reynolds equations, Reynolds Average N-S (RANS) Equation, Statistical theories of turbulence, turbulence models, Coherent Structures and Turbulent bursting.				
3	Boundary Flows: Boundary layer concepts, Boundary layer parameters, Prandtl'sboundary layer equations, Blassius solution for laminar boundary layer flows, von-Karman Momentum integral equation and its applications, Laminar boundary layer, Turbulent boundary layer flows, Laminar sub	8			

	layer, Boundary layer separation and controls.	
4	Unsteady open channel flow	8
	Wave celerity, classification of water waves according to relative depth, orbital motions,	
	superposition, wave trains and wave energy, transformation of waves, dissipation of wave	
	energy, positive and negative surges in rectangular channel, Momentum and Continuity	
	Equations (Saint Venant Equation), two dimensional unsteady flows.	
5	Spatially varied flow	5
	Basic principles and assumptions, dynamic equation and analysis of flow profiles, Numerical integration method, Isoclinal method, spatially varied steady and unsteady surface flows.	
	Introduction: Hydrodynamic and Pollutant transfer in open channel	

Assessment: Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class the standard standard

test or assignmenton liveproblems or courseproject.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumber of respective lecture hours asmention in the syllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. Applied Hydrodynamics: H.R. Vallentine, ELBS Publication.
- 2. Fluid Mechanics: Grade & Mirajgaonkar.
- 3. Fluid Mechanics: Victor L Streeter & E.B. Wylie, Mc-Graw HillViscous Fluid Flow:Frank M White, Mc-Graw Hill.
- 4. Fluid Mechanics and Hydraulics: Dr. S.K. Ukrande, Ane's Books Pvt. Ltd. (Revised Edition, 2012), ISBN 97893 8116 2538.
- 5. Fluid Mechanics. Kumar, D.S. S.K. Kataria& Sons Publishers, New Delhi, 1998.
- 6. Fluid Mechanics and Hydraulic Machines: R. K. Bansal, Laxmi Publications (P) Ltd., New, Delhi, 2000.
- 7. Turbulent Flow: Garde, R.J. New Age International (P) Ltd. Publishers, New Delhi, 2005.

- 8. Fluid Dynamics: Daiy and Harleman, Addition Wesley, New York, 1973.
- 9. Fluid Mechanics: R.A. Granger Dover Publications, New York, 1995.
- 10. Ranga Raju K.G., Flow through Open Channels, TATA MC Graw-Graw-Hill publishing Company Limited, 1997.
- 11. Chow V T, Open Channel Hydraulics, McGraw-Hill Book Company, International editions, New Delhi, 1973.

SemesterI						
Course Code	Course Name	Credits				
WRC 102	Applied Hydrology	03				

TeachingScheme							
Co	CreditsAssigned						
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total	
03			03			03	

	EvaluationScheme								
		Theory		Term Work/Practic al/Oral			Total		
InternalAssessment			EndS	Duration					
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus					
Module	Content	Hours			
1	Introduction: Introduction to hydrology, hydrological cycle.	02			
2	Precipitation: Definition, types and forms of precipitation, precipitation	04			
	gauges, analysis of data, supplementing missing data, consistency of				
	record, hyetograph, mass curve analysis, depth areas duration analysis.				
	Rainfall frequency analysis.				
3	Evapotranspiration : Introduction to Evaporation, transpiration,	06			
	evapotranspiration, Factors affecting, measurement, network design,				
	estimation of evaporation and evapotranspiration, evaporation retardation.				
4	Infiltration: Capacity, rates and indices, factors affecting, measurement of	04			
	infiltration, estimation of infiltration capacity from hydrograph analysis.				
5	Hydrometry: Measurement of discharge, selection of site for stage and	06			
	discharge measuring station non-recording and recording gauges, accuracy				
	and frequency of observed data, discharge measurement by area velocity				
	method and slope area method.				
6	Runoff: Runoff, components of runoff, factors affecting runoff, storage	06			
	effects of runoff from snowmelt, estimation of average monthly and annual				
	runoff, determination of rainfall - runoff relationships by various methods.				
7	Hydrograph: Introduction to hydrograph, Master recession curve, base	06			
	flow and its separation, unit hydrograph theory and its application for				
	isolated and complex storms, synthetic unit hydrograph, S- curve, unit				
	hydrograph of varied durations, instantaneous unit hydrograph, conceptual				
	hydrograph.				
8	Design flood: Rational and empirical relationships, flood frequency	03			
	analysis, recurrence interval design.				

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. Chow Ven-Te, Maidment, David R. and Mays Larry W., "Applied Hydrology" Mc Graw hill Publications, 1995.
- 2. Singh V. P., "Elementary Hydrology", prentice hall of India, 1994.
- 3. Ragunath H.M., "Hydrology", Wily Eastern Ltd, 1996.
- 4. Subramanya K. "Engineering hydrology". Tata Mc-Graw Hill, 3rd edition, 2009.
- 5. Jayarami Reddy P., "Stochastic Hydrology" Laxmi Publications, New Delhi 1995.

	SemesterI	
Course Code	Course Name	Credits
WRPE1011	Program Elective 1: Applied Statistics	03

TeachingScheme							
Co	CreditsAssigned						
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total	
03			03			03	

	EvaluationScheme								
	Theory		Term Work/Practic al/Oral			Total			
Inter	InternalAssessment End			Duration					
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus					
Module	Content	Contact			
		Hours			
1	Basic Concepts of Probability Theory: Probability, random variables,	6			
	moments, moment generating functions, standard distributions, two				
	dimensional random variables, central limit theorem.				
2	Estimation Theory: Principle of least squares – regression and	6			
	correlation (multiple and partial), estimation of parameters – maximum				
	likelihood estimates – method of moments.				
3	Testing of Hypothesis: Sampling distributions: Tests based on normal.	8			
	Chi-square and F- distributions, analysis of variance – one way and two				
	way classifications.				
4	Random Process: Classification – stationary random process, Markov	6			
	process, Markov chains, Poisson process, birth and death process, simple				
	queuing applications				
5	Time Series: Characteristics and representation, moving averages,	7			
	exponential smoothing, auto regressive process, other related models,				
	study of time series plots and scatter plots.				
6	Laplace transform: Laplace transforms of elementary functions, shifting	6			
	theorem, change of scale property, Inverse Laplace transforms, Laplace				
	transforms of derivatives, Laplace transforms of integrals.				

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. Anderson O. D. and Perryman M. R., "Time Series Analysis", North-Holland, Amesterdam, 1981.
- 2. Anderson, O. D., "Time Series Analysis, Theory and Practice I", North-Holland Amsterdam, 1982.
- 3. Bhat U.N., "Elements of Applied Stochastic Processes", Wiley Series in Probability and Mathematical Statistics, Second Edition, 1984.
- 4. Fruend, John E. and Miller Irwin, "Probability and Statistics for Engineers", Prentice Hall, 1980.
- 5. John, B., Kennedy and Adam, M. Neville, "Basic Statistical Methods" Harper and Row Publishers, New York, 1986.
- 6. Spiegel, "Laplace Transform" (Schaum Series).
- 7. Srinivasan, S. K., and Mehta, K.M., "Probability and Random Processes", Tata Mc Graw Hill, 1981.

SemesterI							
Course Code	Course Name	Credits					
WRPE1012	Program Elective 1: Watershed Development and	03					
	Management						

TeachingScheme							
Co	CreditsAssigned						
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total	
03			03			03	

	EvaluationScheme								
Theory						Ferm Vork/Pra I/Oral	Total		
Inter Test1	rnalAsses Test2	sessmentEndS2Average		Duration ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus						
Module	Content	Contact				
		Hours				
1	Introduction to watershed: Concept, significance of geology, soil and	9				
	morphological characteristics, land capability classification, delineation,					
	codification, factors influencing, watershed development. Fundamental					
	concepts of geomorphology, geomorphic agents and processes,					
	weathering and soil processes.					
2	Soil Conservation Practice: Types of Erosion- causes, factors, effects	10				
	and control, water erosion: engineering measures for erosion control in					
	agricultural and non-agricultural lands, estimation of soil loss, water					
	harvesting techniques, design of small water harvesting structures, types					
	of storage structures, yield from a catchment.					
3	Watershed Management: Strategies, identification of problems,	12				
	watershed development, plan entry point activities, concept of priority					
	watersheds, agro forestry, grassland management, wasteland					
	management, watershed approach in government programmes developing					
	collaborative know how, people's participation, evaluation of watershed					
	management.					
4	Watershed Assessment Models-Regulation and restoration, a brief	08				
	description and significance of watershed models: SWAT, TMDL,					
	AGNPS, BASINS, and CREAMS – Case Studies.					

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $\label{eq:constraint} 3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) and$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. Paul, Debarry A., "Watersheds", Wiley and Sons, 2004.
- 2. Devanport E. Thomas, "Watershed Project Management Guide", Lewis Publishers, London, 2003.
- 3. Das, Ghanashyam., "Hydrology and Soil Conservation engineering", Prentice Hall of India Private Limited, New Delhi, 2000.
- 4. Glenn O. Schwab, "Soil and Water Conservation Engineering", John Wiley and Sons, 1981.
- 5. Singh, Gurmail, "A Manual on Soil and Water Conservation", ICAR Publication, New Delhi, 1982.
- 6. Suresh, R., "Soil and Water Conservation Engineering", Standard Publication, New Delhi, 1982.
- 7. Thornbury, W.D., "Principles of Geomorphology", Wiley, 1968.

	SemesterI	
Course Code	Course Name	Credits
WRPE1013	Program Elective 1: Ground Water Engineering	03

TeachingScheme							
Co	CreditsAssigned						
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total	
03			03			03	

	EvaluationScheme								
		Theory		Term Work/Practic al/Oral			Total		
Inter	InternalAssessment]			Duration					
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus					
Module	Content	Contact			
		Hours			
1	Introduction: Ground water occurrence and its role in Hydrological cycle,	09			
	geological formations such as aquifers; types of aquifers, ground water				
	movement, Darcy's law, permeability and its measurement, tracing of				
	ground water movement, fundamental equations for steady and unsteady				
	ground water flow, flow nets.				
2	Well hydraulics: Steady and unsteady flow in confined, semi-confined	12			
	and unconfined aquifers, radial flow, superposition, interference among the				
	wells. Different methods of well construction; construction of well casings				
	and screens, natural and artificial gravel packed wells. Safe yields,				
	estimation, pumping and recuperation tests. Infiltration galleries, ground-				
	water replenishment, recharge of ground water, different ground water				
	recharge methods.				
3	Groundwater modelling: Physical models, analog models, mathematical	12			
	modelling, unsaturated flow models. Introduction to numerical models of				
	groundwater flow, finite differential equations, finite difference solution				
	applicable in ground water modelling.				
4	Salt water intrusion: Concept; interface and its location, control of	06			
	intrusion, pollutant transport, Plume Transport, source identification, tracer				

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) an$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

Recommended Books:

- 1. Todd David Keith, "Groundwater Hydrology", John Wiley publishers, 2004.
- 2. Jacob and Bear, "Hydraulics of Groundwater", McGraw Hill, 1997.
- 3. Mutreja K.N., "Applied Hydrology", Tata McGraw-Hill Publishing company Ltd., New Delhi, 1990.
- Raghunath, "Groundwater & Well Hydraulics", Wiley Eastern Ltd, New Delhi, 1992Singh V. P., "Elementary Hydrology", Prentice Hall, INDIA.(1992).

Walton W.C, "Groundwater Modelling Utilities", Lewis Publications, Boca-Raton, 1992.

	SemesterI	
Course Code	Course Name	Credits
WRPE1021	Program Elective 2: EnvironmentalImpactAssessment	03

TeachingScheme							
Co	CreditsAssigned						
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total	
03			03			03	

	EvaluationScheme								
Theory					Term Work/Practic al/Oral			Total	
InternalAssessment		EndS	Duration						
			emEx	ofEnd	TW	PR	OR		
Test1	Test2	Average	am	SemE					
				xam					
20	20	20	80	03 Hrs.				100	

Detailed Syllabus						
Module	Content	Hours				
1	Concept of environmental impact analysis: Legislations, laws and	10				
	actsrelevant to environmental protection in India – factors for consideration					
	inassessing environmental impacts- measurement of environmental					
	impacts, shorttermandlong-					
	termeffects.Socioeconomicimpactanalysis,typesof					
	socioeconomicimpacts, outline of the basic steps in performing socioe conomici					
	mpact assessment.					
2	Airqualityimpactanalysis: Airpollutants-sources, atmospheric interaction-	10				
	environmental impact assessment methodology, noise impactanalysis-					
	typical considerations, environmental impacts and effects of noise					
	onpeople, control of noise pollution.					
3	Waterqualityimpactanalysis: Waterqualitycriteria and standards, environme	10				
	ntal water quality impacts by projects like highways,					
	powerplants, mining, agriculture and irrigation, forest management. energy impa					
	ctanalysis-energyimpactconsiderations,organizationand					
	methodology.					
4	Vegetationand wildlifeimpact analysis: Environmentassessment,	9				
	methodologies, summarization of environmental, impact checklist method, matr					
	ix method, and networkmethod.					

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) an$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. John G.Rau and David C. Wooten. -EnvironmentalImpact Analysis Handbook.
- 2. Canter, Environmental ImpactAssessment

SemesterI					
Course Code	Course Name	Credits			
WRPE1022	Program Elective 2: SoilScience&Agro-Technology	03			

TeachingScheme							
ContactHours			CreditsAssigned				
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total	
03			03			03	

	EvaluationScheme								
Theory					Term Work/Practic al/Oral			Total	
Inter Test1	rnalAsses Test2	ssment Average	EndS emEx am	Duration ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus					
Module	Content	Contact Hours			
1	Classification of soils: Types of soils and characteristics of soils with special signific	6			
	ancewithreferenceto agriculturaluse.				
2	Properties of Soils: Physical, chemical and biological properties of soilsand	6			
	their utility in crop production, Types of fertilizers and their				
	reactions, preparation of soil maps; cropproduction potential. Principles of croppro				
	duction, inputs to crop productions.				
3	Weedsandmethodsofweedcontrol:Preventive,cultural,chemical,biological	8			
	and mechanical control of weeds, soilfertilizerdoses as				
	peroptimumrequirement.				
4	Crop Physiology: Introduction and principle of crop physiology, Growthanddevelopment,seedphysiology,vegetativepropagation,micropropagat ion, physiology associated with grafting and rootstocks. Plant andcropstandphotosynthesis,Effectsofphotoperiod,temperature,lightintensitya ndlightqualityonplantgrowthanddevelopment.Stressphysiology related to environmental factors, introduction to growth analysisandsimpleforecastingsystems.	6			
5	DryLandFarming:IntroductiontoDryland,drylandagricultural,drylandcrops,drought,dryfarming,characteristicsofdrylandagricultural.dryfarming,characteristicsof	7			
6	Agroclimatologyofcropplanning:Principlesofagroclimatologyweather elements, climatic elements-and their diurnal, seasonal, and annualvariationsanditsvariability.climatologywithgraphs,mapsandatlasshowin g distribution of pressure, wind, temperature, rainfall, evaporation,radiation and dew, with special reference to climatology of India,	6			

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. FothH.D.and TurkL.M., -Fundamentals of soil science Wileypublication.
- 2. Miller R.W.and Donahue R.L-An introductiontosoiland plant growth 6th edition, Englewood Cliffs N.J.Prentice Hall
- 3. MisraR.D.andAhmedM.,—ManualonIrrigationAgronomylOxford&IBHPub.

	SemesterI	
Course Code	Course Name	Credits
WRPE1023	Program Elective 2: Watershed Management	03

TeachingScheme							
Co	CreditsAssigned						
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total	
03			03			03	

EvaluationScheme								
Theory						Ferm Vork/Pra I/Oral	Total	
Inter	InternalAssessment EndS Duration							
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR	
20	20	20	80	03 Hrs.				100

Detailed Syllabus					
Module	Content	Contact Hours			
1	Soil Erosion & Its Control: Basic concepts of soil erosion; Factors affecting	6			
	soil erosion; Types of erosion: Water erosion, Wind erosion, Gully erosion				
	and Stream bank erosion; Models for estimating soil erosion losses (USLE);				
	Climate change and soil erosion risk; Soil erosion control structures and their				
	design: Contour bunding, Graded bunding, Bench terracing and Contour				
	trenching.				
2	Soil & Water Conservation: Need of soil and water conservation; Soil survey;	6			
	Water harvesting techniques: Farm Ponds & Percolation Tanks: Selection of				
	site, Survey & Design; Design and construction of Cement NallaBandhara				
	(CNB) structures.				
3	Hydrology of Watershed: Hydrological processes in watershed; Hydrologic	8			
	Modeling of watershed; Estimation of peak design runoff rate: (Rational				
	method and Curve number method).				
4	Watershed Development & Management: Watershed development: Ridge to	6			
	Valley Concept; Watershed characteristics; Watershed delineation; Land use				
	capability classification.				
5	Irrigation System Management: Irrigation system management; Design of	7			
	irrigation quality management system; Participative irrigation management.				
6	: Land Grading & Drainage: Land grading survey and design: (Plane and	6			
	Profile methods); Drainage design criteria & drainage equations; Design,				
	construction & maintenance of surface and subsurface drainage systems.				

Assessment: Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

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- 2. Allquestion carryequalmarks
- $\label{eq:constraint} 3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) and$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

References:

1. Fangmeier, W., Elliott, W.J., Workman, S., Huffman, R. and Schwab, G.O. 2005, Soil and Water Conservation Engineering, 5th Edition, Cengage Learning, Inc., Clifton Park, USA.

2. Murthy, V.V.N., 2002, Land and Water Management Engineering. 4th Edition, Kalyani Publishers, New Delhi.

3. Suresh, R., 2004, Soil and Water Conservation Engineering, Standard Publishers, New Delhi.

SemesterI					
CourseCode	CourseName	Credits			
WRIE1011	InstituteLevelElective:ProductLifecycleManagement	03			
TeachingScheme					

	CreditsAssigned					
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

EvaluationSchem

e

Theory					Term	work/Pract	ical/Oral	
Intern	InternalAssessment End		Durationof				TotalMarks	
Test1	Test2	Average	SemEx	End SemExam	TW	PR	OR	
			am					
20	20	20	80	03Hrs.				100

Objectives:

- Tofamiliarize the students with the need, benefits and components of PLM
- ToacquaintstudentswithProductDataManagement&PLMstrategies
- Togiveinsightsintonewproductdevelopmentprogramandguidelinesfordesigninganddevelopingapr oduct
- $\bullet \quad To familiarize the students with Virtual Product Development$

Module	DetailedContents	Hrs
	IntroductiontoProductLifecycleManagement(PLM):	
	Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases Opportunities of Clobalization Pro PLM Environment, PLM Paradigm	
	Importance & Benefits of PI M Widespread Impact of PI M Focus and Application	
Ι	A PLMProject, Startingthe PLMInitiative, PLMApplications	10
	PLMStrategies:	
	Industrial strategies, Strategy elements, its identification, selection and	
	implementation, Developing PLMV is ion and PLMS trategy, Changeman agement for PL	
	M	
	ProductDesign:	
	Product Design and Development Process, Engineering Design, Organization	
	and Decomposition in Product Design, Typologies of Design Process Models, Reference	
	Model, Product Design in the Context of the Product Development Process, Relation with	
II	the Development Process Planning Phase, Relation with	
	the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Methodological Evolution in Product Design, Concurrent the Postdesign Planning Phase, Postdesign Planning Phase,	09
	Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineerin	
	gandLifeCycleApproach,NewProductDevelopment	
	(NPD) and Strategies, Product Configuration and Variant Management, The Design	

	forXSystem,ObjectivePropertiesandDesignforX Tools,Choice ofDesignforX									
	ToolsandTheir Usein theDesignProcess									
	ProductDataManagement(PDM):									
III	Product and Product Data, PDM systems and importance, Components of									
	PDM,ReasonforimplementingaPDMsystem,financial justificationofPDM,barriersto									
	PDMimplementation									
	VirtualProductDevelopmentTools:	05								
IV	Forcomponents, machines, and manufacturing plants, 3DCAD systems and realistic rende									
	ringtechniques, Digitalmock-up, Modelbuilding, Modelanalysis,									
	Modelingand simulationsin ProductDesign, Examples/Casestudies									
	IntegrationofEnvironmentalAspectsin ProductDesign:									
	SustainableDevelopment,DesignforEnvironment,NeedforLifeCycleEnvironmental									
V	Strategies, Useful Life Extension Strategies, End-of-Life									
	Strategies, Introduction of Environmental Strategies into the Design Process, LifeCycle									
	EnvironmentalStrategies andConsiderationsforProductDesign									
	LifeCycleAssessment andLifeCycleCost Analysis:	05								
	Properties, and Framework of LifeCycleAssessment, Phases of LCA in ISOS tandards,									
VI	Fields of Application and Limitations of Life Cycle Assessment, CostAnalysis and									
	the Life Cycle Approach, General Framework for LCCA, Evolution									
	ofModelsforProductLife Cycle CostAnalysis									
•		£								

ContributiontoOutcomes:

Studentswillbeable to

- GainknowledgeaboutphasesofPLM,PLMstrategiesandmethodologyforPLMfeasibilitystudyandPD M implementation.
- Illustratevariousapproachesandtechniques fordesigninganddevelopingproducts.
- Applyproductengineeringguidelines/thumbrulesindesigningproductsformoulding,machining,sheet metal workingetc.
- Acquireknowledgeinapplyingvirtualproductdevelopmenttoolsforcomponents,machiningandmanufa cturingplant

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentionin thesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) an$

(b)will befrom anymodule other than module3)

4. OnlyFour question needtobe solved.

References:

1. JohnStark, "ProductLifecycleManagement:Paradigmfor21stCenturyProductRealisation", Springer-Verlag, 2004. ISBN:1852338105

2. FabioGiudice, GuidoLaRosa, AntoninoRisitano, "ProductDesignfortheenvironment-Alifecycle approach", Taylor&Francis2006, ISBN:0849327229

3. SaaksvuoriAntti,ImmonenAnselmie,"ProductLifeCycleManagement",Springer,Dreamtech, ISBN:3540257314

4. MichaelGrieve, "ProductLifecycleManagement:Drivingthenextgenerationofleanthinking", TataMcGrawHill,2006,ISBN:0070636265

SemesterI					
CourseCode	CourseName	Credits			
WRIE1012	InstituteLevelElective: ReliabilityEngineering	03			

TeachingScheme

		Cr	editsAssigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

EvaluationScheme

Theory					Termwork/Practical/Oral			
Intern	nalAssess	sment	End	Durationof				TotolMorks
Test1	Test2	Averag e	SemEx am	EndSem Exam	TW	PR	OR	i otanviai ks
20	20	20	80	03Hrs.				100

Objectives

- Tofamiliarize the students with various aspects of probability theory
- Toacquaint thestudents with reliability and its concepts
- $\bullet \quad To introduce the student stomethods of estimating the system reliability of simple and complex systems$
- Tounderstandthevariousaspectsof Maintainability, Availability and FMEA procedure

Module	DetailedContents	Hrs
	Probabilitytheory: Probability: Standard definitions and concepts; Conditional	
	Probability,Baye'sTheorem.	
т	$\label{eq:probability} Distributions: Central tenden cy and Dispersion; Binomial, Normal, Poisson, Weing the second sec$	08
1	bull, Exponential, relations between the mand their significance.	
	Measuresof Dispersion: Mean, Median, Mode, Range, MeanDeviation, Standard	
	Deviation, Variance, SkewnessandKurtosis.	
	$\label{eq:relation} Reliability Concepts: {\it Reliability} definitions, {\it Importance} of {\it Reliability}, {\it Quality} Assurance and {\it Reliability} and {\it Reliability}, {\it Reliability} and {\it Reliability}$	
	Reliability,Bath Tub Curve.	
п	FailureDataAnalysis:Hazardrate,failuredensity,FailureRate,MeanTimeToFailure	08
11	(MTTF), MTBF, ReliabilityFunctions.	
	ReliabilityHazard Models: Constant Failure Rate, Linearlyincreasing, Time	
	$Dependent\ Failure Rate,\ Weibull Model. Distribution functions and reliability analysis.$	
тт	${\small System Reliability:} System Configurations: Series, parallel, mixed configuration, kout$	05
111	ofnstructure,Complexsystems.	
	Reliability Improvement: Redundancy Techniques: Element redundancy,	
137	Unitredundancy, Standbyredundancies. Markovanalysis.	08
1 V	SystemReliabilityAnalysis-Enumeration method,Cut-set method,Success	
	Pathmethod, Decomposition method.	

	MaintainabilityandAvailability:Systemdowntime,DesignforMaintainability:Maintenan							
	ce requirements, Design methods: Fault Isolation and self-diagnostics,	0 -						
V	Parts standardization and Interchange ability, Modularization and Accessibility, Repair Vs Rep	05						
	lacement.							
	Availability–qualitative aspects.							
	FailureMode,EffectsandCriticalityAnalysis:Failuremodeeffectsanalysis,severity/critic							
VI	ality analysis, FMECA examples. Fault tree construction, basic	05						
	symbols, development of functional reliability block diagram, Fault tree analysis and Event tree							
	Analysis							

Outcomes

Studentswillbeable to...

- Understandandapplythe concept of Probabilityto engineeringproblems
- Applyvarious reliabilityconcepts to calculatedifferent reliabilityparameters
- Estimatethesystem reliability of simple and complex systems
- Carryouta FailureMode Effect andCriticalityAnalysis

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention in thesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart(b)will befrom anymodule other than module3)
- 4. OnlyFour questionneedto besolved.

References:

- 1. L.S.Srinath, "ReliabilityEngineering", Affiliated East-WastPress(P) Ltd., 1985.
- 2. CharlesE.Ebeling,"ReliabilityandMaintainabilityEngineering",TataMcGrawHill.
- 3. B.S.Dhillion, C.Singh, "EngineeringReliability", John Wiley & Sons, 1980.
- 4. P.D.T.Conor, "Practical Reliability Engg.", John Wiley & Sons, 1985.
- 5. K.C.Kapur, L.R.Lamberson, "ReliabilityinEngineeringDesign", JohnWiley&Sons.
- 6. MurrayR.Spiegel,"ProbabilityandStatistics", TataMcGraw-HillPublishingCo. Ltd.

SemesterI					
CourseCode	CourseName	Credits			
WRIE1013	InstituteLevelElective:ManagementInformationSystem	03			

TeachingScheme

		Cr	editsAssigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

EvaluationScheme

		Th	eory		Termwor	rk/Practical	/Oral	
Inte Test 1	ernalAsso Test2	essment Average	End SemEx am	Durationof End SemExam	TW	PR	OR	TotalMarks
20	20	20	80	03Hrs.				100

Objectives:

- Thecourseisblendof ManagementandTechnicalfield.
- Discuss the roles played by information technology into day's business and define various technology architectures on which information systems are built
- Define and analyzetypical functional information systems and identify how they meet the needs of the firm to deliver efficiency and competitive advantage
- Identifythebasicsteps insystems development

Module	DetailedContents	Hrs
I	IntroductiontoInformationSystems(IS):ComputerBasedInformationSystems,ImpactofIT onorganizations,ImportanceofIStoSociety.OrganizationalStrategy, CompetitiveAdvantages andIS.	4
п	DataandKnowledgeManagement:DatabaseApproach,BigData,DatawarehouseandData Marts, KnowledgeManagement. Businessintelligence(BI):ManagersandDecisionMaking,BIforDataanalysisand PresentingResults	7
III	EthicalissuesandPrivacy:InformationSecurity.Threatto IS,andSecurityControls	7
IV	SocialComputing(SC):Web2.0and3.0,SCinbusiness-shopping,Marketing, OperationalandAnalyticCRM,E-businessandE-commerce–B2BB2C.Mobilecommerce.	7
V	ComputerNetworksWiredandWirelesstechnology,Pervasivecomputing,Cloud computingmodel.	6
VI	InformationSystemwithinOrganization:TransactionProcessingSystems,FunctionalArea Information System,ERP andERPsupportof Business Process. AcquiringInformationSystemsandApplications:VariousSystemdevelopmentlife cyclemodels.	8

ContributiontoOutcomes

Studentswill be ableto:

- ExplainhowinformationsystemsTransform Business
- Identifytheimpactinformationsystemshaveonan organization
- DescribeITinfrastructureanditscomponentsanditscurrenttrends
- Understandthe principal tools and technologies for accessing information from databases toimprovebusiness performanceand decision making
- Identifythetypesofsystemsusedforenterprise-wideknowledgemanagementandhowtheyprovidevalue for businesses

Assessment: Internal:

Assessment consists of two tests out of which; one

shouldbecompulsoryclasstestandtheotheriseitheraclasstest or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehoursasmention in thesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart
- (b)will befrom anymodule other than module3)
- 4. OnlyFourquestion needtobe solved.

References:

- 1. KellyRainer,BradPrince, ManagementInformationSystems,Wiley
- 2. K.C. Laudon and J.P. Laudon, Management Information Systems: Managing the Digital Firm, 10thEd.,PrenticeHall, 2007.
- 3. D.Boddy, A. Boonstra, ManagingInformationSystems:StrategyandOrganization,PrenticeHall,2008

SemesterI					
CourseCode	CourseName	Credits			
WRIE1014	InstituteLevelElective: DesignofExperiments	03			
	TeachingScheme				

	CreditsAssigned					
Theory	Practical Tutorial		Theory	Practical	Tutorial	Total
03			03			03

EvaluationScheme

Theory				Termwork/Practical/Oral				
Inter	nternalAssessment EndSem		Durationof				TotelMarks	
Test1	Test2	Average	EndSeni	EndSem Exam	TW	PR	OR	i otanviai KS
20	20	20	80	03Hrs.				100

Objectives:

- Tounderstandtheissues and principlesofDesignofExperiments(DOE)
- Tolisttheguidelines for designing experiments
- Tobecome familiar with methodologies that can be used in conjunction with experimental designs for robustness and optimization

Module	DetailedContents				
I	Introduction				
	1.1 Strategyof Experimentation				
	1.2 TypicalApplications ofExperimentalDesign				
	1.3 GuidelinesforDesigningExperiments				
	1.4 Response SurfaceMethodology				
п	FittingRegressionModels				
	2.1 LinearRegressionModels				
	2.2 EstimationoftheParametersinLinearRegressionModels	08			
	2.3 HypothesisTestinginMultipleRegression				
	2.4 ConfidenceIntervalsinMultipleRegression	08			
	2.5 Predictionofnewresponseobservation				
	2.6 Regressionmodeldiagnostics				
	2.7 Testingforlackoffit				
	Two-LevelFactorialDesigns				
	3.1 The2 ² Design				
	3.2 The 2 ³ Design				
ттт	3.3 TheGeneral2 ^k Design				
111	3.4 ASingleReplicateof the2 ^k Design				
	3.5 TheAddition ofCenterPoints tothe2 ^k Design,				
	3.6 Blockingin the2 ^k FactorialDesign				
	3.7 Split-PlotDesigns				

IV	Two-LevelFractionalFactorialDesigns		
	4.1 TheOne-Half Fractionofthe2 ^k Design		
	4.2 TheOne-QuarterFractionofthe 2 ^k Design		
	4.3 TheGeneral2 ^{k-p} FractionalFactorialDesign		
	4.4 Resolution IIIDesigns		
	4.5 ResolutionIVandVDesigns		
	4.6 FractionalFactorialSplit-PlotDesigns		
	ResponseSurfaceMethodsandDesigns		
	5.1 IntroductiontoResponseSurfaceMethodology		
V	5.2 TheMethodofSteepestAscent		
	5.3 Analysisof aSecond-OrderResponseSurface		
	5.4 ExperimentalDesignsforFittingResponseSurfaces		
VI	TaguchiApproach		
	6.1 CrossedArrayDesignsandSignal-to-NoiseRatios		
	6.2 AnalysisMethods		
	6.3 Robustdesignexamples		

ContributiontoOutcomes

Studentswill beable to

- $\bullet \quad Plandata collection, to turn data into information and to make decisions that lead to appropriate action$
- Applythe methods taughtto real lifesituations
- Plan, analyze, and interpret the results of experiments

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentionin thesyllabus.

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- 2. Allquestion carryequalmarks
- $\label{eq:constraint} 3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) and$

(b)will befrom anymodule other than module3)

4. OnlyFourquestion needtobe solved.
References:

- Raymond H. Mayers, Douglas C. Montgomery, Christine M. Anderson-Cook, Response SurfaceMethodology: Process and Product Optimization using DesignedExperiment, 3rdedition, JohnWiley&Sons, New York, 2001
- 2. D.C.Montgomery, Designand Analysisof Experiments, 5thedition,JohnWiley&Sons,NewYork,2001
- GeorgeEPBox,JStuartHunter,WilliamGHunter,StaticsforExperimenters:Design,Innovationand Discovery,2ndEd. Wiley
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SemesterI						
CourseCode	CourseName	Credits				
WRIE1015	InstituteLevelElective: OperationResearch	03				

TeachingScheme

	CreditsAssigned					
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

EvaluationScheme

Theory				Termwork/Practical/Oral				
Intern	nalAssess	ment	End	Durationof				TotalMarks
Test1	Test2	Avg	SemEx am	End SemExam	TW	PR	OR	i otanviai KS
20	20	20	80	03Hrs.				100

Objectives:

- Formulateareal-worldproblemasamathematicalprogrammingmodel.
- $\bullet \quad Understand the mathematical tools that are needed to solve optimization problems.$
- Usemathematical softwareto solve theproposed models.

Module	DetailedContents	Hrs						
	Introduction to Operations Research: Introduction, , Structure of the							
	MathematicalModel, Limitations of Operations Research							
	Linear Programming: Introduction, Linear Programming Problem, Requirements							
	of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method Penalty Cost							
	MethodorBigM-method,TwoPhaseMethod,Revisedsimplexmethod,Duality, Primal -							
	Dual construction, Symmetric and Asymmetric Dual, Weak Duality Theorem,							
	Complimentary Slackness Theorem, Main Duality Theorem, DualSimplexMethod,							
	SensitivityAnalysis							
	TransportationProblem:Formulation,solution,unbalancedTransportationproblem.							
Ι	I Finding basic feasible solutions – Northwest corner rule, least cost methodand							
	Vogel's approximation method. Optimality test: the stepping stone method							
	andMODImethod.							
	$\label{eq:assignmentProblem} AssignmentProblem: Introduction, Mathematical Formulation of the Problem, Hungarian and the problem of the pro$							
	Method Algorithm, Processing of n Jobs Through Two Machines and mMachines,							
	Graphical Method of Two Jobs m Machines Problem Routing							
	Problem, TravellingSalesman Problem							
	IntegerProgrammingProblem:Introduction,TypesofIntegerProgramming							
	Problems, Gomory's cutting plane Algorithm, Branchand Bound Technique. Introductiont							
	o Decomposition algorithms.							

п	Queuingmodels :queuingsystemsand structures,singleserverandmulti-servermodels, Poisson input, exponential service, constant rate service, finite and infinitepopulation	05						
	Simulation : Introduction, Methodology of Simulation, Basic Concepts, SimulationProcedure, Application of Simulation Monte-Carlo Method:Introduction,	05						
111	Monte- CarloSimulation,ApplicationsofSimulation,AdvantagesofSimulation,Limitations							
	ofSimulation							
	Dynamic programming . Characteristics of dynamic programming. Dynamic							
IV	programmingapproachforPriorityManagementemploymentsmoothening,capitalbudget	05						
	ing,StageCoach/ShortestPath, cargoloadingandReliabilityproblems.							
	GameTheory.Competitivegames,rectangulargame,saddlepoint,minimax(maximin)							
V	method of optimal strategies, value of the game. Solution of games	05						
v	with saddle points, dominance principle. Rectangular games without saddle point-mixed	05						
	strategyfor2 X 2games.							
VI	InventoryModels:ClassicalEOQModels,EOQModelwithPriceBreaks,EOQ	05						
V I	withShortage,ProbabilisticEOQModel,							

Outcomes:

Studentswill be ableto

- Understandthetheoreticalworkingsofthesimplexmethod, therelationshipbetweenalinearprogram and its dual, includingstrongdualityandcomplementaryslackness.
- Performsensitivityanalysistodeterminethedirectionandmagnitudeofchangeofamodel's optimalsolutionasthedatachange.
- Solve specialized linear programming problems like the transportation and assignment
- Understandtheapplicationsofintegerprogramming and aqueuingmodelandcompute

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Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentioninthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $\label{eq:constraint} 3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) and$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour questionneedto besolved.

References:

- 1. Taha,H.A. "Operations Research-An Introduction", PrenticeHall, (7thEdition), 2002.
- 2. Ravindran, A, Phillips, D. TandSolberg, J.J. "OperationsResearch: Principles and Practice", John Willeya nd Sons, 2nd Edition, 2009.
- 3. Hiller, F.S. and Liebermann, G.J. "Introduction to Operations Research", TataMcGrawHill, 2002.
- 4. OperationsResearch,S.D.Sharma,KedarNathRamNath-Meerut.
- 5. OperationsResearch,KantiSwarup,P.K.GuptaandManMohan,SultanChand&Sons.

SemesterI						
CourseCode	CourseName	Credits				
WRIE1016	InstituteLevel Elective:CyberSecurityandLaws	03				

TeachingScheme

	CreditsAssigned					
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

EvaluationScheme

Theory					Termwork/Practical/Oral					
InternalAssessment		End	Durationof				TotoMorks			
Test1	Test2AverageSemExam	Test2 Ayers	Test2	Augrago	Sem	EndSem	TW	PR	OR	1 Otaliviai KS
		Exam	Exam							
20	20	20	80	03Hrs.				100		

Objectives:

- Tounderstandandidentifydifferent typescybercrimeandcyberlaw
- TorecognizedIndianIT Act2008anditslatestamendments
- Tolearnvarioustypesofsecuritystandards compliances

Module	DetailedContents	Hrs
I	IntroductiontoCybercrime: Cybercrimedefinitionandoriginsoftheworld,Cybercrime and information security, Classifications of cybercrime, Cybercrime andthe IndianITA2000,AglobalPerspectiveon cybercrimes.	4
п	Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engg, Cyberstalking, Cybercafé and Cybercrimes, Botnets, Attack vector, Cloud computing,Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Fraudsin Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices,Registry Settings for Mobile Devices, Authentication Service Security, Attacks onMobile/CellPhones,MobileDevices: SecurityImplicationsforOrganizations,OrganizationalMeasuresfor HandlingMobile,Devices-RelatedSecurityIssues, Organizational SecurityPoliciesandMeasuresinMobileComputingEra Laptops	9
ш	ToolsandMethodsUsedin CyberlinePhishing, Password Cracking, Keyloggers and Spywares, Virus andWorms,Steganography,DoSandDDoSAttacks,SQLInjection,BufferOverFlow,AttacksonWireless Networks, Phishing,IdentityTheft (IDTheft)	6
IV	TheConceptofCyberspaceE-Commerce, The Contract Aspects in Cyber Law, The Security Aspect ofCyberLaw, TheIntellectual PropertyAspect inCyberLaw,TheEvidenceAspectinCyber Law, TheCriminal AspectinCyber Law,GlobalTrends in Cyber Law, Legal Framework for Electronic DataInterchangeLawRelatingto ElectronicBanking, TheNeedforanIndian Cyber Law	8

	IndianITAct.	
V	CyberCrime andCriminal	6
	Justice:Penalties,AdjudicationandAppealsUndertheITAct,2000,IT Act. 2008and its	
	Amendments	
VI	InformationSecurityStandardcompliances	6
٧I	SOX,GLBA,HIPAA, ISO,FISMA,NERC,PCI.	0

Outcomes

Studentswill beable to:

- Understandthe conceptofcybercrimeand itseffectonoutsideworld
- Interpret and applyIT law invarious legalissues
- Distinguishdifferentaspectsofcyberlaw
- ApplyInformation SecurityStandards complianceduringsoftwaredesignand development

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Someguidelinesforsettingupthequestionpaper.Minimum80%syllabusshouldbecoveredinquestionpapersof end semester examination.

Inquestionpaperweightageofeachmodulewillbeproportionaltonumberofrespectivelecturehoursas mention in thesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour questionneedto besolved.

References:

- 1. NinaGodbole,SunitBelapure, CyberSecurity,WileyIndia, New Delhi
- 2. TheIndianCyberLawbySureshT.Vishwanathan;BharatLawHouseNewDelhi
- 3. TheInformationtechnologyAct,2000;BareAct- ProfessionalBookPublishers,New Delhi.
- 4. Cyber Law & CyberCrimesByAdvocatePrashantMali;SnowWhitePublications,Mumbai
- 5. NinaGodbole,InformationSystemsSecurity, WileyIndia,NewDelhi
- 6. KennetchJ.Knapp,CyberSecurity&GlobalInformationAssuranceInformationSciencePublishing.
- 7. WilliamStallings,CryptographyandNetworkSecurity,PearsonPublication
- 8. Websitesformoreinformationis available on: TheInformation TechnologyACT,2008-TIFR :https://www.tifrh.res.in
- 9. Website for more information, A Compliance Primer for IT professional:https://www.sans.org/reading-room/whitepapers/compliance/compliance-primer-professionals- 33538

SemesterI						
CourseCode	CourseName	Credits				
WRIE1017	InstituteLevelElective: DisasterManagement andMitigation	03				
	Measures					

TeachingScheme

	CreditsAssigned					
Theory	eory Practical Tutorial		Theory	Practical	Tutorial	Total
03			03			03

EvaluationScheme

		Theor	ry		Termwork/Practical/Oral			
InternalAssessment			End	Durationof				TotolMorks
Test1	Test2	Test2 Average	Average Sem EndSem TW F	PR	OR	I Utalivial KS		
			Exam	Exam				
20	20	20	80	03Hrs.				100

Objectives

- Tounderstandphysics and various types of disaster occurring around the world
- To identifyextent and damaging capacity of a disaster
- Tostudyand understandthe means of lossesandmethods toovercome /minimizeit.
- Tounderstandrole of individual and various organization during and after disaster
- TounderstandapplicationofGISinthe fieldofdisastermanagement
- Tounderstandtheemergencygovernmentresponsestructuresbefore, duringandafterdisaster

Module	DetailedContents	Hrs					
I	Introduction 1.1 Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, longtermeffectsof disasters. Introduction toglobal warming and climate change.						
Ш	 NaturalDisasterandManmadedisasters: 2.1 Natural Disaster: Meaning and nature of natural disaster,Flood, Flash flood,drought,cloudburst,Earthquake,Landslides,Avalanches,Volcaniceruption s,Mudflow,Cyclone, Storm, Storm Surge,climate change, global warming, sealevel rise,ozonedepletion 2.2 ManmadeDisasters:Chemical,Industrial,NuclearandFire Hazards.Roleofgrowingpopulationandsubsequentindustrialization,urbanizationan dchanging lifestyleofhumanbeingsinfrequentoccurrencesofmanmadedisasters. 	09					

	DisasterManagement,PolicyandAdministration				
	3.1 Disastermanagement:meaning,concept,importance,objectiveofdisastermanageme				
	ntpolicy, disasterrisks in India, Paradigmshift in disaster management.				
III	3.2 Policyand administration:	06			
	Importance and principles of disaster management policies, command and co- ordinationofindisastermanagement, rescue operations-how to start with and				

v InstitutionalFrameworkforDisasterManagementinIndia: 4.1 Importanceofpublicawareness,Preparationandexecutionofemergencymanagement programme.ScopeandresponsibilitiesofNationalInstituteofDisasterManagement(N IDM)andNationaldisastermanagementauthority(NDMA)inIndia. 06 IV Methodsandmeasurestoavoiddisasters,Managementofcasualties, set up of emergency facilities, importance of effective communicationamongstdifferentagencies in such situations. 06 4.2 UseofInternetandsoftwaresforeffectivedisastermanagement.Applicationsof GIS,RemotesensingandGPS inthisregard. Image: State of the state overallmanagement of disasters. Various NGO's and the works they have carried out inthepast on theoccurrenceof various disasters, Waysto approach theseteams. 09 VI 6.1 Pre-disaster,duringdisasterandpost-disastermeasuresinsomeeventsingeneral 6.2 Structuralmapping:Riskmapping,assessmentandanalysis,seawallsandembankmen ts,Bio shield, shelters,earlywarningand communication 6.3 Non-Structural Mitigation: Community based disaster preparedness, risk transferand risk financing, capacity development and training, awareness and education,contingencyplans. 06 6.4 Do'aanddon'tsincaseofdiiastersand effectiveimplementationofreliefaids 06		howtoproceedinduecourseoftime, studyofflowchartshowing the entire								
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education, contingencyplans. 6.4 Do's and don't sincase of disasters and effective implementation of reliefaids		transferand risk financing, capacity development and training, awareness and								
6.4 Do'sanddon'tsincaseofdisastersand effective implementation of reliefaids		education, contingency plans.								
or bo surgeon ismousoraisustersung encenvenipiementationenenenenen.		6.4 Do'sanddon'tsincaseofdisastersand effectiveimplementationofreliefaids.								

Outcomes:

tudentswillbeable to...

- Gettoknow naturalas well asmanmadedisasterandtheirextentand possibleeffectson theeconomy.
- Planofnationalimportancestructuresbasedupon theprevioushistory.
- Get acquainted with government policies, acts and various organizational structure associated withanemergency.
- Gettoknowthesimpledo'sanddon'tsinsuchextremeeventsandactaccordingly.

Assessment: Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentioninthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart(b)will befrom anymodule other than module3)
- 4. OnlyFour questionneedto besolved.

References:

- 1. 'DisasterManagement'byHarshK.Gupta, UniversitiesPressPublications.
- 2. 'Disaster Management: AnAppraisalofInstitutionalMechanismsinIndia'byO.S.Dagur, published byCentreforlandwarfarestudies, New Delhi, 2011.
- 3. 'IntroductiontoInternationalDisasterManagement'byDamonCopolla,ButterworthHeinemann ElseveirPublications.
- $4. \ `Disaster Management Handbook' by Jack Pinkowski, CRCP ress Taylor and Francisg roup.$
- 5. 'Disastermanagement & rehabilitation' by Rajdeep Dasgupta, Mittal Publications, New Delhi.
- 6. 'NaturalHazards andDisasterManagement,VulnerabilityandMitigation-RBSingh,RawatPublications
- 7. ConceptsandTechniquesofGIS-C.P.LoAlbert,K.W.Yonng-Prentice

Hall(India)Publications.(Learners are expected to refer reports published at national and International level and updated information available on authentic web sites)

SemesterI						
CourseCode	CourseName	Credits				
WRIE1018	InstituteLevelElective:EnergyAuditandManagement	03				

TeachingScheme									
	S		Cro	editsAssigned					
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total			
03			03			03			

EvaluationScheme

		Theor	У	Termwork/Practical/Oral				
InternalAssessment			End	Durationof				TotolMorks
Test1	Test2	Test 2		Sem EndSem TW	TW	PR	OR	I Utanviai KS
		estz Average	Exam	Exam				
20	20	20	80	03Hrs.				100

Objectives:

- Tounderstand theimportanceenergysecurityforsustainabledevelopmentandthe fundamentalsofenergyconservation.
- To introduce performance evaluation criteria of various electrical and thermal installations tofacilitatetheenergymanagement
- To relate the data collected during performance evaluation of systems for identification of energysavingopportunities.

Module	DetailedContents	Hrs
I	EnergyScenario: PresentEnergyScenario,EnergyPricing,EnergySectorReforms,EnergySecurity, EnergyConservationanditsImportance,EnergyConservationAct- 2001anditsFeatures.Basics ofEnergyand itsvarious forms,Materialand Energybalance	04
Π	EnergyAudit Principles: Definition, Energy audit- need, Types of energy audit, Energy management (audit)approach- understandingenergycosts,Benchmarking,Energyperformance,Matching energy use to requirement, Maximizing system efficiencies, Optimizingtheinputenergyrequirements,Fuelandenergysubstitution.Elementsofmonit oring&targetingEnergyauditInstruments;Dataandinformation-analysis. Financialanalysistechniques:Simplepaybackperiod,NPV,Returnoninvestment (ROI),Internalrateofreturn(IRR)	08
III	EnergyManagementandEnergyConservationinElectricalSystem: Electricitybilling,ElectricalloadmanagementandmaximumdemandControl;Power factor improvement, Energy efficient equipments and appliances, star ratings. Energyefficiencymeasuresinlightingsystem,Lightingcontrol: Occupancyse nsors,daylight integration, and useofintelligent controllers. Energyconservationopportunitiesin:waterpumps,industrialdrives,induction motors.motorretrofitting.softstarters.variablespeeddrives.	10

	EnergyManagementandEnergyConservationinThermalSystems:								
	Review of differentthermal loads; Energy conservation opportunities in:								
	Steamdistribution system, Assessment of steam distribution losses, Steam leakages,								
	Steamtrapping, Condensate and flash steam recovery system.	10							
IV	General fuel economy measures in Boilers and furnaces, Waste heat recovery, use	10							
	ofinsulation-typesandapplication.HVACsystem:Coefficientofperformance,Capacity,								
	factors affecting Refrigeration and Air Conditioning system performanceandsavings								
	opportunities.								
	EnergyPerformanceAssessment:								
V	OnsitePerformanceevaluationtechniques,Casestudiesbasedon:Motorsand								
v	variablespeeddrive,pumps,HVACsystemcalculations;LightingSystem:InstalledLoad								
	EfficacyRatio (ILER) method, Financial Analysis.								
	EnergyconservationinBuildings:								
VI	Energy Conservation Building Codes (ECBC): Green Building, LEED rating, Application of the second	03							
	fNon-Conventional and RenewableEnergySources								

Outcomes:

Studentswill be ableto:

- Toidentifyand describepresent state of energy security and its importance.
- Toidentifyanddescribethe basicprinciplesandmethodologies adoptedinenergyaudit of anutility.
- To describe the energy performance evaluation of some common electrical installations and identifytheenergysavingopportunities.
- Todescribe the energy performance evaluation of some common thermal installations and identify the energy saving opport unities
- Toanalyzethedatacollected duringperformanceevaluation and recommend energy saving measures

Assessment: Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 5. Questionpaperwillcompriseoftotalsixquestion
- 6. Allquestion carryequalmarks
- 7. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart
- (b)will befrom anymodule other than module3)
- 8. OnlyFour question needtobe solved.

References:

- 1. HandbookofElectricalInstallationPractice,GeofryStokes,BlackwellScience
- 2. Designingwithlight:LightingHandbook,ByAnilValia,LightingSystem
- 3. EnergyManagementHandbook, ByW.C. Turner, JohnWileyand Sons

- 4. HandbookonEnergyAuditsandManagement,edited byA. K.Tyagi, TataEnergyResearchInstitute(TERI).
- 5. EnergyManagementPrinciples,C.B.Smith,PergamonPress
- 6. EnergyConservation Guidebook,DaleR. Patrick, S. Fardo,RayE.Richardson,Fairmont Press
- 7. HandbookofEnergyAudits,Albert Thumann, W.J. Younger, T.Niehus,CRCPress
- 8. www.energymanagertraining.com
- 9. www.bee-india.nic.in

Semester I						
Course Code	Course Name	Credits				
WREIE 1019	Institute Level Optional Course – I: Development	03				
	Engineering					

Teaching Scheme

	Contact Hours	8		Credi	ts Assigned	
Theory	Theory Practical Tutoria		Theory	Practical	Tutorial	Total
03			03			03

Evaluation Scheme

		Theo	ry	Term work / Practical / Oral					
Internal Assessment			End	Duration of				Total Marka	
Test 1	Test 2	st 1 Test 2 Avg	Aug	Sem	End Sem	TW	PR	OR	I Utal Marks
			Avg	Exam	Exam				
20	20	20	80	03 Hrs.				100	

Objectives:

- 1. To understand the characteristics of rural Society and the Scope, Nature and Constraints of rural Development
- 2. To study Implications of 73rd CAA on Planning, Development and Governance of RuralAreas
- 3. An exploration of human values, which go into making a 'good' human being, a 'good' professional, a 'good' society and a 'good life' in the context of work life and the personal life of modern Indian professionals
- 4. To understand the Nature and Type of Human Values relevant to PlanningInstitutions

Module	Detailed Contents	Hrs.					
Ι	Introduction to Rural Development Meaning, nature and scope of development;	08					
	Nature of rural society in India; Hierarchy of settlements; Social, economic and						
	ecological constraints for rural development Roots of Rural Development in						
	India Rural reconstruction and Sarvodayaprogramme before independence;						
	Impact of voluntary effort and Sarvodaya Movement on rural development;						
	Constitutional direction, directive principles; Panchayati Raj - beginning of						
	planning and community						
	development; National extension services.						
II	Post-Independence rural Development Balwant Rai Mehta Committee - three	04					
	tier system of rural local Government; Need and scope for people's						
	participation and Panchayati Raj; Ashok Mehta Committee						
	- linkage between Panchayati Raj, participation and rural development.						
III	Rural Development Initiatives in Five Year Plans Five Year Plans and Rural	06					
	Development; Planning process at National, State, Regional and District levels;						

	Planning, development, implementing and monitoring organizations and	
	agencies; Urban and rural interface - integrated approach and local plans;	
	Development initiatives and their convergence; Special component plan and	
	sub-plan for the	
	weaker section; Micro-eco zones; Data base for local planning; Need for	
	decentralized planning; Sustainable rural development.	
IV	Post 73rd Amendment Scenario 73rd Constitution Amendment Act, including -	04
	XI schedule, devolution of powers, functions and finance; Panchayati Raj	
	institutions - organizational linkages; Recent changes in rural local planning;	
	Gram Sabha - revitalized Panchayati Raj; Institutionalization; resource	
	mapping, resource mobilization including social mobilization; Information	
	Technology and	
	rural planning; Need for further amendments.	
V	Values and Science and Technology Material development and its values; the	10
	challenge of science and technology; Values in planning profession, research	
	and education.	
	Types of Values Psychological values — integrated personality; mental health;	
	Societal values — the modern search for a good society; justice, democracy,	
	rule of law, values in the Indian constitution; Aesthetic values — perception	
	and enjoyment of beauty; Moral and ethical values; nature of moral judgment;	
	Spiritual values; different concepts; secular spirituality; Relative and absolute	
	values; Human values— humanism and human values; human rights; human	
	values as freedom, creativity,	
	love and wisdom.	
VI	Ethics Canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility;	04
	Work ethics; Professional ethics; Ethics in planning profession, research and	
	education	

Outcomes: Learner will be able to...

- 1. Apply knowledge for RuralDevelopment.
- 2. Apply knowledge for ManagementIssues.
- 3. Apply knowledge for Initiatives and Strategies
- 4. Develop acumen for higher education and research.
- 5. Master the art of working in group of differentnature.
- 6. Develop confidence to take up rural project activities independently

Assessment:

Internal Assessment for 20 marks:

Consisting Two Compulsory Class Tests

Firsttestbasedonapproximately40% of contents and second testbased on remaining contents (approximately 40% but excluding contents covered in TestI)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

- 1. Question paper will comprise of total six questions, each carrying 20marks
- 2. Question 1 will be compulsory and should cover maximum contents of thecurriculum
- 3. Remaining questions will be mixed in nature (for example if Q.2 has part (a) from module

3 then part (b) will be from any module other than module3)

4. <u>Only Four questions need to be solved</u>

Reference

- 1. ITPI, Village Planning and Rural Development, ITPI, NewDelhi
- 2. Thooyavan, K.R. Human Settlements: A 2005 MA Publication, Chennai
- 3. GoI, Constitution (73rdGoI, New Delhi Amendment) Act, GoI, NewDelhi
- 4. Planning Commission, Five Year Plans, Planning Commission
 5. Planning Commission, Manual of Integrated District Planning, 2006, PlanningCommission NewDelhi
- 6. Planning Guide toBeginners
- 7. Weaver, R.C., The Urban Complex, Doubleday.
- 8. Farmer, W.P. et al, Ethics in Planning, American Planning Association, Washington.
- 9. How, E., Normative Ethics in Planning, Journal of Planning Literature, Vol.5, No.2, pp.123-150.
- 10. Watson, V., Conflicting Rationalities: -- Implications for Planning Theory and Ethics, Planning Theory and Practice, Vol. 4, No.4, pp.395–407

	SemesterI	
Course Code	Course Name	Credits
WREL101	Program Lab-I	02

TeachingScheme							
ContactHours CreditsAssigned							
Theory	Practical	Tutorial	Theory Practical Tutorial Total				
	2		1 02				

	EvaluationScheme								
Theory] V al	Total					
Inte Test1	rnalAsse Test2	ssment Average	EndS emEx am	Duration ofEnd SemE	TW	PR	OR		
					25		25	50	

Module	Content
1	To determine the infiltration rate of a particular plot of land using double ring
	infiltro-meter, and construct infiltration capacity curves.
2	To study the variation of meteorological parameters, such as air temperature,
	relative humidity, wind speed and wind direction using thermo hygrometer and
	anemometer.
3	To study the variation of hydrological parameters, water level and water
	temperature/ conductivity in a bore well using water level recorder.
4	To study free vortex and forced vortex phenomenon.
5	Performance characteristics of turbines.

	SemesterI	
Course Code	Course Name	Credits
WRESBL101	Skill Based Lab-I	02

TeachingScheme						
ContactHours CreditsAssigned						
Theory	Practical	Tutorial	Theory Practical Tutorial Total			
	4			2		02

	EvaluationScheme							
Theory Term Work/Practic al/Oral					Total			
Inte	rnalAsse	ssment	EndS	Duration				
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR	
					50		50	100

Objectives

- To make students aware about the difference between listening and hearing
- To enhance speaking and technical writing skills.
- To prepare students to face interviews, group discussions.

Module	Description	Hrs
Ι	Listening Skills: Barriers to listening, Kinds of Listening & Note making.	02
Π	 Speaking Skills: Voice Modulation, Good Pronunciation, Speaking without fear, Extempore & Prepared speaking, Body Language, Telephone Etiquette/ Mobile /Video conferences. Presentation Skills: Planning, preparing, Organizing, Delivery, Feedback. 	05
Ш	Reading Skills: SQ3R Reading Technique, Skimming and Scanning	03
IV	Writing Skills:	10

	 Building Vocabulary, Effective Sentences & paragraphs, Organizational Techniques & patterns, Summarizing. Content writing: Social media post, blogs, LinkedIn Building Network Approach, articles and testimonials for websites Media tools: like surfer SEO tools, keyword planner, copywritely, HubSpot topic generator, Grammarly, QuillBot 	
V	Types of Writing: Letters, memo, Reports/ Proposals/ Research Paper/ Conference Paper/ E- mails/Sharing Documents On-line.	04
VI	Interview: Pre-Interview Preparation, Interview Question Answer, Resume & Job Application, Group Discussion, Telephone Interviews.	03
IX	Seminar Presentation on the following Topics: (1) Time Management (2) Motivation (3) Negotiation & Conflict Management (4) Stress Management (5) IPR (6) Transactional Analysis (7) Leadership (8) Emotional Intelligence (EQ/IQ) (9) Assertiveness	02

Contribution to Outcomes

Students will be able to:

- Differentiate between listening and hearing
- Develop speaking and technical writing skills
- Execute interviews, group discussions and presentation skill

Reference Books

- 1. Effective Technical Communication- M. Ashraf Rizvi (Tata McGraw Hill)
- 2. HBR Guide to Better Business Writing- Bryan A. Garner (Harvard Business Review Press)

SemesterII

SemesterII						
Course Code	Course Name	Credits				
WRC 201	Water Resources Economics Planning	03				
	and Management					

TeachingScheme						
Co	CreditsAssigned					
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

	EvaluationScheme								
	Theory		Term Work/Practic al/Oral			Total			
Inte	InternalAssessment EndS Duration								
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus				
Sr. No	Content	Contact		
		Hours		
1	Planning and decision-making process: Importance and necessity of	6		
	planning, decision making process and various types and feasibility.			
2	Systems Approach to Water Resource Planning: Water as economic	8		
	commodity, Principles of economics.			
3	Economics of Planning: Global scenario of water resources planning,	`10		
	Discounting techniques, Price theory, Resource allocation, project optimality			
	conditions. Cost benefits studies, Role of benefit cost parameters in project			
	selection. Economic feasibility tests. Decision making under uncertainty and			
	risk. Cost benefit studies of single & multipurpose projects. Economic			
	planning, capacity expansion.			
4	Multi objective planning: Methods and analysis of multi objective	8		
	planning, Stakeholders' participation, Preparation of feasibility report,			
	interstate water disputes and case study.			
5	International development on water transfer: Principles and challenges of	7		
	IWRM. Importance and necessity, international water laws, trity etc.			

Assessment: Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. Kuiper, "Water Resources Project Economics" Buttersworth, London. 1971.
- M. C. Chaturvedi, "Water Resources System Planning and Management" (1987), Tata McGraw Hill Co. New Delhi.
- 3. Helweg, O.J. "Water Resources Planning and Management" John Wiley and Sons Inc., USA.1985.

SemesterII						
Course Code	Course Name	Credits				
WRC 202	Design of Hydraulic Structures	03				

TeachingScheme						
Co	CreditsAssigned					
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

	EvaluationScheme								
	Theory		Term Work/Practic al/Oral			Total			
Inter Test1	rnalAsses Test2	ssment Average	EndS emEx am	Duration ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus

Sr. No	Content	Contact
		Hours
1	Planning and investigations of reservoir and dam sites: Choice and site	6
	selection of dams and reservoirs, Forces acting on solid gravity dam, modes	
	of failures, stability analysis, elementary and practical profile of gravity	
	dam, internal stresses and stress concentrations in gravity dam, joints, seals,	
	keys in gravity dams, galleries, dam safety and hazard mitigation.	
2	Homogeneous and zoned embankment dams: factors influencing design	6
	of embankment dams, criteria for safe design of embankment dam, steps in	
	design of embankment dam, seepage analysis and its control through body	
	and dam foundation, classification of rock fill dams and their design	
	consideration, causes and failure of earthen dam.	
3	Arch and buttress Dams: Types of arch dams and buttress dams, design	8
	and analysis of arch dams and buttress dams, and their suitability.	
4	Spillways: Capacity of spillways, components and profile of different types	6
	spillways, Non-conventional type of spillways, selection and design of	
	energy dissipaters	

5	Diversion headworks: Components of diversion head works and their	7
	functions, weirs barrages, Blighs Creep theory, Lanes weighed theory.	
	Design of weirs and barrages on permeable foundations.	
6	Canal structures: Canal outlets, types of cross-drainages works, review of	6
	codes of practice, design of canal drops, operation and maintenance of	
	canals.	

Assessment: Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- USBR, "Design of gravity dams", A Water Resources Technical Publication, Denver, Colorado, 1976.
- 2. USBR, "Design of small dams", a water resources technical publication, Oxford and IBH publishing co., New Delhi, 1974.
- Creager W P, Justin J. D and Hinds J., "Engineering for dams" Nemchand and Brothers, Roorkee, 1995.
- 4. Irrigation Engineering and Hydraulic structures (Abridged Edition). Dr S.K. Ukarande, Ane's Student Edition., 2015.
- 5. Khatsuria, R M, "Hydraulics of spillways and energy dissipators", CRC Press, 2005.
- 6. Novak P, "Hydraulic Structures", Taylor and Francis Group publishers, 2001.
- 7. Grishin, M. M. Ed., "Hydraulic Structures", Vol. II, Mir Publishers, Moscow, 1982.

SemesterII						
Course Code	Course Name	Credits				
WRCPE2011	Program Elective 3: System Engineering and Its Application	03				

TeachingScheme						
Co	CreditsAssigned					
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

	EvaluationScheme								
Theory					Term Work/Practic al/Oral			Total	
Inter	InternalAssessment EndS Duration								
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus					
Module	Content	Contact			
		Hours			
1	Economics and Concept of Optimization	09			
	Principles of Engineering Economics -Equivalence of Kind, Equivalence				
	of Time, Sunk Cost, Incremental Cost, Intangible Values, Predictive				
	Uncertainty, Planning, Alternatives, Objectives of water resources				
	development, Economic Analysis and				
	Discounting Techniques, Project Optimality Conditions				
2	Conventional Optimization techniques	12			
	Linear Programming: Formulation of problem, graphical solutions,				
	simplex method.				
	Solution by simplex method - Variations from standard form, the dual				
	problem, Dual simplex method. Sensitivity analysis, Non-linear				
	programming, one dimensional minimization methods - Newton -				
	Raphson method, interval halving method, Fibonacci method, Big M				
	method, Two-phase method, duality.				
	Transportation problems: BFS-Optimality test, maximization problems.				

	Assignment Problems -minimization, maximization.	
	Dynamic Programming (DP): Introduction, solution of DP problems,	
	characteristics of a DP problem, principle of optimality	
3	Application of optimization techniques	09
	Applications of various optimization techniques to water resources	
	engineering problems, applications Non-linear programming, water	
	quality subsystem, optimum operation model for reservoir systems by	
	incremental dynamic programming, sequence of multipurpose projects.	
4	Case Studies-	09
	Conjunctive use of ground water and surface water, hydropower	
	optimization, crop yield optimization, multi-basin and multi-reservoir	
	systems.	
	A Linear Programming Optimization of Water Resource Management	
	with Virtual Water through Global Trade.	
	Nonlinear Reservoir Optimization Model with Stochastic Inflows.	
	Water recourses management by stochastic optimization.	
	Model for optimal allocation of water resources in saltwater intrusion area	
1		

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart(b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- S. Vedula& P P Mujumdar Water Resources Systems, Tata McGraw-Hill Publishing Company Ltd.
- A Ravindran, Don T Philips & James J Solberg, Operations Research principles And Practice. John Wiley & Sons.
- 3. Daniel P. Loucks, Jerry R. Stedinger D.A Haith-Water Resources systems Planning and Management. UNESCO Publishing.
- 4. Hall.W.A&Dracup.J.A- Water Resources Systems Engineering.
- Mays L.W., and Tung YK, Hydro systems Engineering and Management. McGraw Hill Inc., New York, 19925.
- Singiresu S Rao, Engineering Optimization Theory and Practice. New Age International (P) Ltd., Publishers, New Delhi.
- 7. Wagner, H. M., 'Principles of Operations Research', Prentice Hall, 1975.
- 8. Arthur Mass et al, Design of Water Resources Systems, Macmillan, 1970.
- Alvin.S. Goodman, Principles of Water Resources Planning, Prentice Hall, Englewood Cliffs, New Jercey, 1984.

SemesterII					
Course Code	Course Name	Credits			
WRCPE3012	Program Elective 3: WaterPowerEngineering	03			

TeachingScheme						
ContactHours CreditsAssigned					d	
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

EvaluationScheme								
Theory					Term Work/Practic al/Oral		Total	
Inte	rnalAsses	ssment	EndS	Duration	uration			
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR	
20	20	20	80	03 Hrs.				100

	Detailed Syllabus	
Module	Content	Hours
1	Introduction: Development of water power in India, estimation of	02
	hydropowerpotential, comparison of hydro, thermal and nuclear power.	
2	AnalysisofStreamflowDemand:Flowdurationcurve,firmpower,	05
	secondarypower, loadand loadduration curves, load factor, etc.	
3	TypesofHydropowerPlants:Classificationofhydropowerplants,run-of-	04
	riverplants, valley damplants, high head diversion plants, diversion can alplants, p	
	umped storageplants, tidal power plants.	
4	Water Conveyance System: Power canals, Alignment, Design of	06
	powercanals, Flumes, Covered conduits and tunnels, Drainage and	
	ventilation intunnels.Penstocks:-	
	Alignment,typesofpenstocks,economicdiameterof	
	penstocks,Anchor blocks.	
5	Dams:Selectionofsite,preliminaryinvestigations,finalinvestigations,typesof	08
	dams:rigiddams,gravitydams,archandbuttressdams,basic	
	principlesofdesignanddetailsofconstruction.	
6	EmbankmentDams/Spillways:Earthendams,rockfilldams,design	06
	considerations. Types, spillwaygates, design of stilling basins.	
7	TurbinesandPowerhousedetails:Typesandutility,layoutandpartsof	04

	thegenerationsystem.forebay,intakes,balancingreservoir,escape, surgeshafts/inc	
	linedshafts.Generallayoutofpowerhouseandarrangementof	
	hydropowerunits.undergroundpowerstations: generalinformation	
8	TransmissionSystem:Generalintroduction, basicprinciplesofdesignand	04
	construction.Financialimplicationsofhydropowerplants.	

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart(b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. Mosonyl, E., —Water Power Development Vol. I & II.
- 2. Brown, G. Etal., —Hydro Electric Engineering Practicel Vol. I, II & III.
- 3. Dandekar M.M., -Water Power Engineering VIkas Pub. House Pvt.Ltd

	SemesterII	
Course Code	Course Name	Credits
WRCPE2013	Program Elective 3: Advanced Hydrologic Analysis and Design	03

TeachingScheme						
ContactHours CreditsAssigned					d	
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

	EvaluationScheme							
Theory Term Work/Practic al/Oral						Total		
Inte	rnalAsse	ssment	ment EndS Duration					
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR	
20	20	20	80	03 Hrs.				100

	Detailed Syllabus	
Module	Content	Hours
1	Hydrologic and Hydraulic Models: Hydrologic investigations, systems	10
	approach, and concept of a model. Classification of hydrological models,	
	Chow-Kulandaiswamy model. Time-area methods, unit hydrograph,	
	Instantaneous Unit Hydrograph. Synthetic Unit Hydrographs. Clark	
	model, Nash model, Tank model.	
2	Hydrologic Simulation and Stream Flow Synthesis: Classification of	10
	hydrologic simulation models. Single-event rainfall-runoff models.	
	Continuous simulation models, groundwater flow simulation models.	
	Streamflow synthesis, risk analysis - design storms and its synthesis.	
	Design flows, urban storm drainage, design, airport drainage design,	
	detention storage design.	
3	Random Processes: Classification, stationary random process,	09
	components of time series, trend analysis, regression, multiple linear	
	regression, diagnostic tools.	
4	Forecasting Models: Box Jenkins' models, correlation, Auto correlation,	10
	Partial auto correlation - Yule Walker equations - AR (p) - MA (q) -	
	ARMA (p,q) – ARIMA (p,d,q) models, model formulation, validation,	
	and application.	

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class stest or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumber of respective lecture hours as mention in the syllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. Singh, V. P., "Hydrologic Systems", Prentice-Hall Englewood Cliffs, NJ 1989.
- 2. Jayarami Reddy P., "Stochastic Hydrology" Laxmi Publications, New Delhi 1995.
- 3. Viessman W Jr. "Introduction to Hydrology (5ed)" Pearson Education, Inc. 2003.
- 4. Haan C.T., "Statistical Methods in Hydrology" Iowa State Press 2002.

	SemesterII	
Course Code	Course Name	Credits
WRCPE2021	Program Elective 3: Integrated River Basin Management	03

TeachingScheme						
Co		Cr	editsAssigne	d		
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

	EvaluationScheme								
	Theory		Term Work/Practic al/Oral			Total			
InternalAssessmentEnTest1Test2Averagean			EndS emEx am	Duration ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus						
Module	Content	Hours				
1	Introduction: Global and national scenario in general. Naturally	9				
	functioning river basin river system. Concept of integration in the river					
	basin setting. Conservation, management and development of water.					
	Economic and social benefits, restoring freshwater ecosystem.					
2	River basin planning and management: water quantity and quality and	10				
	its protection; Land use; socio-economic condition; Integrated water					
	resource planning management including water supply and demand					
	management; urban and rural water development; decision support for					
	river basin management; International river basin management including					
	conflict and resolution and sustainable development. Maintenance of echo					
	system, conventional approaches.					
3	Climate change and water resources sustainability: Reasons, details of	10				
	climate change, and sustainable development introduction to cost-benefit					
	analysis economic evaluation of environmental goods environmental and					
	social cost-benefit analysis.					
4	Long term vision: Stake holders and initiates, integration of policies,	10				
	decision and cost across, sectoral interest includes industry, agricultural,					
	urban development, navigation, fisheries, fisheries management and					
	conservations, strategic decision making at river basin scheme.					

Assessment: Internal:

s test or assignmenton liveproblems or courseproject.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumber of respective lecture hours as mention in the syllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $\label{eq:constraint} 3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) and$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. Kemper, Karin; Blomquist, William; Dinar, "Integrated River Basin Management through Decentralization" Ariel (Eds.) 2007.
- 2. SahaS.K.,"River basin management theory and practice" Chichester: John Wiley, 1981.
- Falconer R. A. "River basin management" Cardiff University, United Kingdom and W. R. BLAIN, Wessex Institute of Technology, United Kingdom.

SemesterII							
Course Code	Course Name	Credits					
WDCDE2022	Program Elective 3: Soft Computing Techniques in Hydrology and	03					
W NCT E2022	Water Resources Engineering						

TeachingScheme								
ContactHours	ContactHours CreditsAssigned							
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total		
03			03			03		

	EvaluationScheme								
		Theory	7		Term Wo	ork/Prac	tical/Oral		
Internal Test1	Assessme Test2	ent Average	EndSem Exam	DurationofE nd SemExam	TW	PR	OR	Total	
20	20	20	80	03 Hrs.				100	

	Detailed Syllabus	
Module	Content	Hours
1	Introduction to Soft computing techniques- soft computing techniques,	04
	importance, types of soft computing techniques, advantages and	
	limitations.	
2	Introduction to Fuzzy logic: Fuzzy sets- Fuzzy set operations- Fuzzy	06
	Relations-Cardinality of Fuzzy Relations-Operations on Fuzzy Relations-	
	Properties of Fuzzy relations- Membership Functions-Features of	
	Membership functions- Fuzzification-Methods of Membership value	
	Assignments- Fuzzy Rule Base-Defuzzification-Defuzzification methods-	
	Fuzzy logic controller (Block Diagram)	
3	Artificial Neural Networks: Basic Concepts-Neural network Architectures-	09
	Single layer feed forward network-Multilayer feed forward network-	
	Recurrent Networks-Characteristics of Neural Networks-Learning methods.	
	Perceptron networks-Back Propagation Networks-Radial base function	
	network-Hopfield network- Kohonen Self organizing maps.	
4	Fundamentals of genetic algorithms and Genetic Programming: Basic	10
	concepts- working principle - encoding different methods - fitness	
	function, reproduction-different methods. Genetic modeling in heritance-	
	Crossover mutation-convergence of genetic algorithm. Basic difference	
	between genetic algorithm and genetic programming.	
5	Introduction to Hybrid systems: Concept of hybrid system and its	10
	significance in general to water resources problems, Neural network, fuzzy	
	logic and genetic algorithm hybrids - Neuro fuzzy hybrids- neuro genetic	
	hybrids-Fuzzy genetic hybrids-Genetic algorithm based back propagation	

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart

(b)will befrom anymodule other than module3)

4. OnlyFour question needtobe solved.

Recommended Books:

1. Rajasekharan, S. and Vijayalakshmi, G.A.Pai, -Neural Network, Fuzzy Logic andGenetic

Algorithms Synthesis and Applications^{II}, Prentice Hall India.

2. Sivanandam, S.N and Deepa, S.N. - Principles of Soft ComputingI, Wiley India

3. Ross Timothy J, —Fuzzy logic with Engineering Applications^I, McGraw Hill, NewYork.

4. Haykins S. —Neural Networks a Comprehensive foundation^{II}, Pearson Education.

5. Goldberg, D.E. —Genetic Algorithms in Search Optimization and Machine Learning, Pearson Education Recent Literature

	SemesterII	
Course Code	Course Name	Credits
WRCPE2023	Program Elective 4: Advances in Irrigation Engineering	03

TeachingScheme							
(ContactHours CreditsAssigned						
Theor	Practical	Tutorial	Theory	Practical	Tutorial	Total	
У							
03			03			03	

	EvaluationScheme								
		Theor	у		Term Work/Practic al/Oral			Total	
InternalAssessment EndS Duration									
Test1	Test2	Average	emEx am	ofEnd SemE xam	TW	PR	OR		
20	20	20	80	03 Hrs.				100	

Detailed Syllabus					
Sr.N o	Content	Contac t			
		Hours			
1	Irrigation Techniques: Surface and Subsurface Irrigation, well Irrigation,Lift Irrigation, Sprinkler Irrigation and Drip Irrigation. Hydraulic design ofLift, Sprinkler & Drip Irrigation. Assessment of irrigation water, Audit ofirrigationwater.Preparationofirrigationschedulesbasedoncropwaterrequirement.Di fferent types ofirrigation water distribution.	9			
2	Reservoir operations: Introduction to reservoir operations, types -Storagecapacity of reservoir – Storage zones – Determining reservoir capacity for agivenyield– Determiningyieldfromareservoirofagivencapacity–Reservoir Losses – Reservoir sedimentation–Siltcontrol. Operationandmaintenanceofcanalsystem, canalautomation. Rivertraining, diversion and protection works. Reservoir operations.	12			
3	Rivers training: types of rivers – its characteristics – Indian rivers and theirclassification – Straight reaches – Bends – Meanders –Cutoff – Control andtrainingofrivers–Objectivesofrivertraining–Classificationofrivertraining – Levees –Guide banks – Groynes – Artificial cutoffs – Pitchedislands.	9			
4	Principles of irrigation water management: Irrigation Efficiencies – Needfor optimization – Management and productivity – Participatory approach –Onfarm development–Command areadevelopment.	9			
Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

RecommendedBooks:

- 1. Zimmerman,-Irrigation Engineering WielyToppan publication.
- 2. Sharma, S.K.-Principles and practice of Irrigation Engineering . Chand and Company Ltd. New Delhi.
- 3. Michael, A. MIrrigation., Theoryand practice Vikas publishing house.
- 4. -Canal Automation . CBIPPublication No. 238, NewDelhi.
- 5. AsawaG.L.,-IrrigationEngineering , NewAgeInternational Publishers, 1996.
- AsawaG.L., -Irrigation and Water ResourcesEngineering , NewAgeInternational Publishers,2007.

SemesterII						
Course Code	Course Name	Cre dits				
WRIE2021	InstituteLevelElective:ProjectManagement	03				

TeachingScheme							
Co	CreditsAssigned						
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total	
03			03			03	

	EvaluationScheme								
		Theor	y]	Гerm			
					Work/Practic				
					al/Oral			Total	
Inte	InternalAssessment			Duration					
			emEx	ofEnd	TW	PR	OR		
Test1	Test2	Average	am	SemE					
				xam					
20	20	20	80	03 Hrs.				100	

- To familiarize thestudents with the useofa structuredmethodology/approachfor each and every unique project undertaken, including utilizing project management concepts, tools and techniques.
- To appraise the students with the project management life cycle and make them

Module	DetailedCo	Hrs
	ntents	
Ι	ProjectManagement Foundation: Definition of a project, Project Vs Operations, Necessity of project management,Triple constraints, Project life cycles (typical & atypical) Project phases and stagegate process. Role of project manager. Negotiations and resolving conflicts. Projectmanagementinvariousorganizationstructures.PMknowledgeareasasperP roject ManagementInstitute(PMI).	5
П	InitiatingProjects: How to get a project started, selecting project strategically, Project selection models(Numeric/ScoringModelsandNon-numericmodels),Projectportfolioprocess,Project sponsor and creating charter; Project proposal.Effective project team, Stagesofteamdevelopment&growth(forming,storming,norming&performing),t eam dynamics.	6
III	ProjectPlanningandScheduling: WorkBreakdownstructure(WBS)and linearresponsibilitychart,Interface Co- ordinationandconcurrentengineering,Projectcostestimationandbudgeting,Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT,CPM,GANTTchart.IntroductiontoProjectManagementInformationSyste	8

	m (PMIS).	
IV	PlanningProjects	
	Crashingprojecttime.Resourceloadingandleveling.Goldratt'scriticalchain.	6
	ProjectStakeholdersand Communicationplan. RiskManagementinprojects:Riskmanagementplanning,Riskidentificationand riskregister.Qualitativeandquantitativeriskassessment,Probabilityandimpactma trix.Risk response strategiesforpositiveandnegativerisks	
V	 5.1 ExecutingProjects: Planningmonitoringandcontrollingcycle.Informationneedsandreporting,engagin gwith all stakeholders of theprojects. Teammanagement,communicationandproject meetings. 5.2 MonitoringandControllingProjects: EarnedValueManagementtechniquesformeasuringvalueofworkcompleted;Usin gmilestonesformeasurement;changerequestsand scopecreep. Projectaudit. 5.3 ProjectContracting Projectprocurementmanagement,contractingandoutsourcing, 	8
VI	 6.1 ProjectLeadershipandEthics: Introductiontoprojectleadership,ethicsinproje cts.Multiculturaland virtual projects. 6.2 ClosingtheProject: Customer acceptance; Reasons ofproject termination, Various types ofprojectterminations(Extinction,Addition,Integration,Starvation),Processofpr ojecttermination,completingafinalreport;doingalessonlearnedanalysis;acknowl edgingsuccessesandfailures;Projectmanagementtemplatesandother resources;Managingwithoutauthority;Areas offurtherstudy. 	6

Outcomes

Studentswill be ableto:

- Applyselectioncriteriaandselectanappropriateprojectfromdifferent options.
- Writeworkbreak downstructureforaprojectanddevelopa schedulebasedonit.
- Identifyopportunities and threats to the project and decide an approach to deal with them strategically.
- UseEarned value techniqueand determine&predict status of the project.
- Capturelessons learnedduringprojectphasesanddocumentthem forfuturereference

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportionaltonumberofrespective lecturehours asmention inthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) an$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour question needtobe solved.

- 1. JackMeredith&SamuelMantel, ProjectManagement: Amanagerialapproach, WileyIndia, 7thEd.
- 2. A Guide to the Project Management Body of Knowledge (PMBOK[®] Guide), 5th Ed, ProjectManagementInstitutePA, USA
- 3. GidoClements, ProjectManagement, CengageLearning.
- 4. Gopalan, Project Management, , Wiley India
- 5. Dennis Lock, Project Management, Gower Publishing England, 9th Ed.

SemesterII						
Course Code	Course Name	Credits				
WRIE2022	InstituteLevelElective:FinanceManagement	03				

TeachingScheme

	CreditsAssigned					
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

EvaluationScheme

Theory				Termy	work/Practic			
Inte	rnalAssess	sment	End	Durationof				TotolMorka
Test1	Test2	A	Sem End TW PR	OR	I Utanviai KS			
		Average	Exam	SemExam				
20	20	20	80	03Hrs.				100

- OverviewofIndianfinancialsystem, instruments and market
- Basicconceptsofvalueofmoney,returnsandrisks,corporatefinance,workingcapitalanditsmanageme nt
- Knowledgeaboutsourcesoffinance,capitalstructure,dividendpolicy

Module	DetailedContents	Hrs
Ι	 Overview of Indian Financial System: Characteristics, Components and FunctionsofFinancial System. FinancialInstruments:Meaning,CharacteristicsandClassificationofBasicFinancialI nstruments—EquityShares,PreferenceShares,Bonds- Debentures,CertificatesofDeposit, and TreasuryBills. FinancialMarkets:Meaning,CharacteristicsandClassificationofFinancialMarkets—Capital Market, MoneyMarket and Foreign CurrencyMarket FinancialInstitutions:Meaning,CharacteristicsandClassificationofFinancial Institutions-CommercialBanks,Investment-MerchantBanksandStockExchanges 	06
Π	Concepts of Returns and Risks: Measurement of Historical Returns and ExpectedReturnsofaSingleSecurityandaTwo- securityPortfolio;MeasurementofHistoricalRiskandExpectedRiskofaSingleSecuritya ndaTwo-securityPortfolio. Time Value of Money: Future Value of a Lump Sum, Ordinary Annuity, andAnnuityDue;PresentValueofaLumpSum,OrdinaryAnnuity,andAnnuityDue; ContinuousCompoundingandContinuousDiscounting.	06
III	Overview of Corporate Finance: Objectives of Corporate Finance; Functions ofCorporateFinance— InvestmentDecision,FinancingDecision,andDividendDecision. FinancialRatioAnalysis:OverviewofFinancialStatements—BalanceSheet, ProfitandLossAccount,andCashFlowStatement;PurposeofFinancialRatio	09

	Analysis;LiquidityRatios;EfficiencyorActivityRatios;ProfitabilityRatios;						
	CapitalStructureRatios;StockMarketRatios;LimitationsofRatioAnalysis.						
IV	CapitalBudgeting:MeaningandImportanceofCapitalBudgeting;InputsforCapital Budgeting Decisions; Investment Appraisal Criterion—Accounting Rate ofReturn,PaybackPeriod,DiscountedPaybackPeriod,NetPresentValue(NPV),Profitab ility Index, Internal Rate of Return (IRR), and Modified Internal Rate ofReturn(MIRR) WorkingCapitalManagement:ConceptsofMeaningWorkingCapital;Importanceof WorkingCapitalManagement;FactorsAffectinganEntity'sWorkingCapitalNeeds;Esti mationofWorkingCapitalRequirements;Management ofInventories; Managementof Receivables; andManagement of Cash andMarketableSecurities.	10					
V	Sources of Finance: Long Term Sources—Equity, Debt, and Hybrids; MezzanineFinance; Sources of Short-Term Finance—Trade Credit, Bank Finance, CommercialPaper;Project Finance. Capital Structure: Factors Affecting an Entity's Capital Structure; Overview ofCapital Structure Theories and Approaches— Net Income Approach, Net OperatingIncomeApproach;TraditionalApproach,andModigliani- MillerApproach.RelationbetweenCapitalStructureandCorporateValue;ConceptofOpt imal CapitalStructure	05					
VI	DividendPolicy:MeaningandImportanceofDividendPolicy;FactorsAffectinganEntity'sDividendDecision;OverviewofDividendPolicyTheoriesandApproaches—Gordon'sApproach,Walter'sApproach,andModigliani-MillerApproach	03					

Outcomes

Studentswill beable to...

- UnderstandIndianfinancesystem and corporate finance
- Takeinvestment, finance as well as dividend decisions

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentioninthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part$

(b)will befrom anymodule other than module3)

4. OnlyFour questionneed to besolved.

- FundamentalsofFinancialManagement,13th Edition(2015)byEugene F.BrighamandJoelF.Houston;Publisher: CengagePublications, NewDelhi.
- 2. Analysis for Financial Management, 10th Edition (2013) by Robert C. Higgins; Publishers: McGrawHillEducation, New Delhi.
- 3. Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw Hill Education,NewDelhi.

SemesterII								
Course Code		Course Name						
WRIE2023	Institu	InstitutelevelElective: EntrepreneurshipDevelopmentand						
	Management							
		Teac	hingScheme					
	ContactHours	5	CreditsAssigned					
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total		
03			03			03		

		The	eory		Termw	ork/Practical		
Interr	nalAssess	ment	End	Durationof				TotalMarks
Test1	Test2	Avera	SemEx	EndSemEx	TW	PR	OR	i Utanviai KS
ge	ge	am	am					
20	20	20	80	03Hrs.				100

- Toacquaintwithentrepreneurship and management of business
- Understand Indianenvironmentforentrepreneurship
- Ideaof EDP,MSME

Module	DetailedContents	Hrs					
Ι	OverviewofEntrepreneurship:Definitions,RolesandFunctions/ValuesofEntrepreneur ship,HistoryofEntrepreneurshipDevelopment,RoleofEntrepreneurshipintheNationalEc onomy,FunctionsofanEntrepreneur,EntrepreneurshipandForms of Business Ownership RoleofMoneyandCapitalMarketsinEntrepreneurialDevelopment:Contributionof GovernmentAgenciesin SourcinginformationforEntrepreneurship						
II	Business Plans and Importance of Capital To Entrepreneurship: Preliminary andMarketingPlans,ManagementandPersonnel,Start- upCostsandFinancingaswellasProjectedFinancialStatements,LegalSection,Insurance,S uppliersandRisks,Assumptions and Conclusion, Capital and its Importance to the EntrepreneurEntrepreneurshipAndBusinessDevelopment:Starting aNewBusiness,Buying anExistingBusiness,NewProductDevelopment,BusinessGrowthandtheEntrepreneur						
III	Women's Entrepreneurship Development, Social entrepreneurship-role and need, EDPcell,roleofsustainabilityandsustainabledevelopmentforSMEs,casestudies, exercises	05					
IV	IndianEnvironmentforEntrepreneurship: key regulationsandlegalaspects, MSMED Act 2006 andits implications, schemesand policies of the Ministry ofMSME, role and responsibilities of various government organizations, departments,banksetc.,RoleofStategovernmentsintermsofinfrastructuredevelopmentsan d	08					

support etc., Public private partnerships, National Skill development Mission, Credited and Science						

	GuaranteeFund,PMEGP,discussions,groupexercisesetc				
V	Effective Management of Business: Issues and problems faced by micro and smallenterprises and effective management of M and S enterprises (risk management, creditavailability,technologyinnovation,supplychainmanagement,linkagewithlarge industries),exercises,e-Marketing	08			
VI	AchievingSuccessinTheSmallBusiness:Stagesofthesmallbusinesslifecycle,fourtypeso ffirm-levelgrowthstrategies,Options-harvestingorclosingsmall businessCriticalSuccessfactorsofsmallbusiness	05			

Outcomes:

Studentswillbeable to...

- Understandthe conceptofbusinessplan andownerships
- Interpretkeyregulationsandlegalaspectsofentrepreneurshipin India
- Understandgovernment policiesforentrepreneurs

Assessment

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentioninthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) an$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour questionneedto besolved.

- 1. PoornimaCharantimath, Entrepreneurshipdevelopment-SmallBusinessEnterprise,Pearson
- 2. EducationRobertDHisrich,MichaelPPeters,DeanAShapherd,Entrepreneurship,latestedition,TheMcGr awHill Company
- 3. DrTNChhabra, EntrepreneurshipDevelopment, SunIndiaPublications, NewDelhi
- $4. \ Dr CNP rasad, Small and Medium Enterprises in Global Perspective, New century Publications, New Delhi$
- 5. VasantDesai,Entrepreneurialdevelopment andmanagement,HimalayaPublishingHouse
- 6. MaddhurimaLall,ShikahSahai,Entrepreneurship,ExcelBooks
- 7. RashmiBansal, STAYhungrySTAYfoolish, CIIE, IIMAhmedabad
- $8. \ Law and Practice relating to Micro, Small and Medium enterprises, Tax mann Publication Ltd.$
- 9. Kurakto, Entrepreneurship-Principles and Practices, Thomson Publication
- 10. Laghu UdyogSamachar
- 11. www.msme.gov.in
- 12. www.dcmesme.gov.in
- 13. www.msmetraining.gov.in

SemesterII							
Course Code	Course Name	Credits					
WRIE2024	InstitutelevelElective: HumanResourceManagement	03					

TeachingScheme

	ContactHours		Credit	sAssigned		
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

EvaluationScheme

Theory					Termwork/Practical/Oral			
InternalAssessment		EndSom	Durationof				Total	
Test1	Test?	Averag	Enusem	End	TW	PR	OR	Marks
10511	10512	e	LAIII	SemExam				
20	20	20	80	03Hrs.				100

- Tointroduce the students with basic concepts, techniques and practices of the human resource manage ment.
- ToprovideopportunityoflearningHumanresourcemanagement(HRM)processes,relatedwiththefu nctions, and challengesin theemergingperspectiveof today'sorganizations.
- Tofamiliarize the students about the latest developments, trends & different aspects of HRM.
- Toacquaintthestudentwiththeimportanceofinter-personal&intergroupbehavioralskillsinanorganizational setting required forfuturestable engineers, leaders and

Module	DetailedContents	Hrs
Ι	IntroductiontoHRHuman Resource Management- Concept, Scope and Importance,InterdisciplinaryApproach Relationship with other Sciences, Competencies of HRManager, HRMfunctions.Human resource development (HRD): changing role of HRM – HumanresourcePlanning,Technologicalchange,Restructuringandrightsizing,Empowerment,TQM,Managingethical issues.	5
Π	OrganizationalBehavior(OB) IntroductiontoOBOrigin,NatureandScopeofOrganizationalBehavior,Relevanceto Organizational Effectiveness andContemporaryissues Personality:MeaningandDeterminantsofPersonality,Personalitydevelopment,Personal ity Types, Assessment of Personality Traits for Increasing Self AwarenessPerception:AttitudeandValue,EffectofperceptiononIndividualDecision- making,Attitude andBehavior. Motivation:TheoriesofMotivationandtheirApplicationsforBehavioralChange(Maslow ,Herzberg, McGregor); Group Behavior and Group Dynamics: Work groups formal and informal groupsand stages of group development. Team Effectiveness: High performing teams,TeamRoles, cross functional and self-directed team. Casestudy	7
III	OrganizationalStructure&Design Structure,size,technology,Environmentoforganization;OrganizationalRoles&	6

	conflicts:Conceptofroles;roledynamics;roleconflictsandstress. Leadership:Conceptsandskillsofleadership,Leadershipandmanagerialroles,Leadershi pstyles andcontemporaryissues in leadership. PowerandPolitics:Sourcesandusesofpower;Politicsatworkplace,Tacticsandstrategies.	
IV	HumanresourcePlanningRecruitment and Selection process, Job-enrichment, Empowerment - Job- Satisfaction, employeemorale.PerformanceAppraisalSystems:Traditional&modernmethods, PerformanceCounselin g, Career Planning.Training&Development:IdentificationofTrainingNeeds, TrainingMethods	5
V	EmergingTrendsin HR Organizational development; Business Process Re-engineering (BPR),BPR as atool for organizational development, managing processes & transformation in HR.OrganizationalChange,Culture, Environment Cross Cultural Leadership and Decision Making: Cross Cultural Communicationanddiversityatwork,causesofdiversity,managingdiversitywithspecial referencetohandicapped,womenandageingpeople,intracompanyculturaldifferencein employeemotivation.	6
VI	 HR&MIS Need, purpose, objective and role of information system in HR, Applications inHRD in various industries (e.g. manufacturing R&D, Public Transport, Hospitals,Hotelsand serviceindustries StrategicHRM RoleofStrategicHRMinthemodernbusinessworld,ConceptofStrategy,StrategicManag ementProcess,ApproachestoStrategicDecisionMaking;StrategicIntent–Corporate Mission, Vision,Objectives andGoals LaborLaws&IndustrialRelations Evolution of IR, IR issues in organizations, Overview of Labor Laws in India;IndustrialDisputes Act,TradeUnionsAct, Shops andEstablishments Act 	10

ContributiontoOutcomes:

Studentswill beable to:

- Understandthe concepts, aspects, techniques and practices of the human resource management.
- UnderstandtheHumanresourcemanagement(HRM)processes,functions,changesandchallengesin today'semergingorganizational perspective.
- Gainknowledge aboutthelatestdevelopmentsandtrendsinHRM.
- $\bullet \quad Apply the knowledge of behavioral skills learn tand integrate it within interpersonal and intergroup environ$

Assessment: Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentionin thesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) an$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour questionneed to besolved.

- 1. StephenRobbins, Organizational Behavior, 16th Ed, 2013
- 2. VS P Rao, Human ResourceManagement, 3rd Ed, 2010, Excelpublishing
- 3. Aswathapa,Humanresourcemanagement:Text&cases,6th edition, 2011
- 4. C. B.MamoriaandSVGankar,Dynamics ofIndustrialRelationsinIndia,15thEd, 2015,HimalayaPublishing,15thedition, 2015
- 5. P.SubbaRao,EssentialsofHumanResourcemanagementandIndustrialrelations,5thEd,2013,Himalaya Publishing
- 6. LaurieMullins, Management&OrganizationalBehavior, LatestEd, 2016, PearsonPublications

SemesterII						
Course Code	Course Name	Credits				
WRIE2025	InstitutelevelElective:ProfessionalEthicsandCSR	03				

TeachingScheme

	ContactHours		Credits	Assigned		
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

		The	eory		Termw			
InternalAssessment			End	Durationof				Total
Test 1	Test2	Average	SemEx am	End SemExam	TW	PR	OR	Marks
20	20	20	80	03Hrs.				100

- Tounderstandprofessionalethics inbusiness
- Torecognizedcorporate socialresponsibility

Module	DetailedContents	Hrs				
	Professional Ethics and Business: The Nature of Business Ethics;					
01	EthicalIssuesinBusiness;	04				
	MoralResponsibilityandBlame;Utilitarianism:Weighing					
	SocialCostsandBenefits;Rightsand DutiesofBusiness					
	$\label{eq:professionalEthicsintheMarketplace:} PerfectCompetition; MonopolyCompetition; Mon$					
	ition; Oligopolistic Competition; Oligopolies and Public					
02	Policy Professional Ethics and the Environment: Dimensions of Pollution and Re	08				
	sourceDepletion;EthicsofPollutionControl;EthicsofConserving					
	DepletableResources					
	ProfessionalEthicsofConsumerProtection: MarketsandConsumerProtection;					
	Contract View of Business Firm's Duties to Consumers; Due					
03	CareTheory; AdvertisingEthics; Consumer Privacy	06				
	ProfessionalEthicsofJobDiscrimination: NatureofJobDiscrimination;					
	ExtentofDiscrimination;Reservation ofJobs.					
	IntroductiontoCorporateSocialResponsibility:PotentialBusinessBenefits—					
	Triplebottomline.Humanresources.Riskmanagement.Supplierrelations:Criticisms					
04	andconcerns—Nature of business: Motives: Misdirection.					
	TrajectoryofCorporateSocialResponsibilityinIndia					
	Corporate Social Responsibility: Articulation of Gandhian					
05	TrusteeshipCorporateSocialResponsibilityandSmallandMediumEnterprises(SME					
	s)in					
	India,CorporateSocialResponsibilityandPublic-PrivatePartnership(PPP)					

	CorporateSocialResponsibilityinGlobalizingIndia:CorporateSocialResponsibi									
06	lity Corpo	Voluntary orateAffairs,C	Guidelines, GovernmentofIr	2009 ndia,Lega	issued alAspectso	by ofCorp	the oorateS	Ministry ocial	of	08
	Resp	onsibility—C	ompaniesAct,2	013.						

Contributiontooutcomes

Studentswillbeable to...

- Understandrightsanddutiesofbusiness
- Distinguish different aspects of corporates ocial responsibility
- Demonstrateprofessionalethics
- Understandlegalaspectsofcorporatesocialresponsibility

Assessment: Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentionin thesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart
- (b)will befrom anymodule other than module3)
- 4. OnlyFourquestion needtobe solved.

- 1. BusinessEthics:TextsandCasesfromtheIndianPerspective(2013)byAnandaDasGupta;Publisher: Springer.
- 2. CorporateSocialResponsibility:ReadingsandCasesinaGlobalContext(2007)byAndrewCrane,DirkMatten,LauraSpence; Publisher:Routledge.
- 3. BusinessEthics:ConceptsandCases,7thEdition(2011)byManuelG.Velasquez;Publisher:Pearson, NewDelhi.
- 4. CorporateSocialResponsibilityin India(2015)byBidyutChakrabarty,Routledge,NewDelhi.

SemesterII						
Course Code	Course Name	Credits				
WRIE2026	InstitutelevelElective:ResearchMethodology	03				
	TeachingScheme	·				

	ContactHours	5	CreditsAssigned							
Theory	Practical Tutorial		Theory Practical Tutorial			Total				
03			03			03				

Theory					Termw	vork/Practica		
InternalAssessment			End	Durationof				Total
Test1	Test2	Average	SemEx am	EndSem Exam	TW	PR	OR	Marks
20	20	20	80	03Hrs.				100

- TounderstandResearch andResearchProcess
- Toacquaintstudentswithidentifyingproblemsforresearchanddevelopresearchstrategies
- $\bullet \quad To familiarize students with the techniques of data collection, analysis of data and interpretation$

Module	DetailedContents	Hrs
01	IntroductionandBasicResearchConcepts1.1 Research-Definition;ConceptofConstruct,Postulate,Proposition,Thesis,Hypothesis,Law,Principle.Research methods vsMethodology1.2 NeedofResearchinBusinessandSocialSciences1.3 ObjectivesofResearch1.4 IssuesandProblemsinResearch1.5 CharacteristicsofResearch:Systematic,Valid,Verifiable,EmpiricalandCritical	09
02	TypesofResearch2.1. BasicResearch2.2. AppliedResearch2.3. DescriptiveResearch2.4. Analytical Research2.5. EmpiricalResearch2.6QualitativeandQuantitativeApproaches	07
03	ResearchDesignandSampleDesign3.1 Research Design-Meaning,TypesandSignificance3.2 SampleDesign-MeaningandSignificanceEssentialsofagoodsamplingStagesinSampleDesignSamplingmethods/techniquesSampleDesignSamplingmethods/techniques	07
04	ResearchMethodology4.1Meaningof ResearchMethodology4.2.StagesinScientificResearchProcess:	08

	a. IdentificationandSelectionofResearchProblem			
	b. FormulationofResearchProblem			
	c. Reviewof Literature			
	d. FormulationofHypothesis			
	e. FormulationofresearchDesign			
	f. SampleDesign			
	g. DataCollection			
	h. DataAnalysis			
	i. Hypothesistestingand InterpretationofData			
	j. PreparationofResearchReport			
	FormulatingResearchProblem			
05	5.1Considerations:Relevance,Interest,DataAvailability,Choiceofdata,Analysis	04		
	of data, Generalization and Interpretation of analysis			
	Outcomeof Research			
06	6.1 Preparationof the report on conclusion reached	04		
00	6.2 ValidityTesting&EthicalIssues	04		
	6.3 SuggestionsandRecommendation			

Outcomes

Studentswill beable to:

- Prepareapreliminaryresearchdesignforprojectsintheirsubjectmatterareas
- Accuratelycollect,analyzeand reportdata
- Presentcomplexdataorsituationsclearly
- Reviewandanalyze researchfindings

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or at least 6 assignment on complete syllabus or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentioninthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- 3. Questionswillbemixedinnature(forexamplesupposedQ.2haspart(a)frommodule3thenpart (b)will be from anymoduleotherthan module3)
- 4. Only Four question need to be
- solved.5.

- $1. \ Daws on, Catherine, 2002, Practical Research Methods, New Delhi, UBSP ublishers Distributors.$
- 2. Kothari, C.R., 1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
- 3. Kumar,Ranjit,2005,ResearchMethodology-AStep-by-StepGuideforBeginners,(2nded),Singapore,Pearson Education

SemesterII						
Course Code	Course Name	Credits				
WRIE2027	InstitutelevelElective:IPR&Patenting	03				
	TeachingScheme					

	-									
	ContactHours	5	CreditsAssigned							
Theory	Practical Tutorial		Theory	Theory Practical Tutorial						
03			03			03				

		Theor	у	Termw				
InternalAssessment			End	Durationof				Total
Tost1	Tost?	Augrago	Sem	EndSem	TW	PR	OR	Marks
TestI	Test2	Average	Exam	Exam				
20	20	20	80	03Hrs.				100

- Tounderstandintellectualpropertyrightsprotectionsystem
- Topromote the knowledge of Intellectual Property Lawsof India as well as International treaty proced ures
- Togetacquaintancewith Patentsearchandpatent filingprocedureandapplications

Module	DetailedContents					
01	Introduction to Intellectual Property Rights (IPR):Meaning of IPR, Differentcategory of IPR instruments - Patents, Trademarks, Copyrights, Industrial Designs,Plantvarietyprotection,Geographicalindications, Transferoftechnologyetc. ImportanceofIPRinModernGlobalEconomicEnvironment:TheoriesofIPR, PhilosophicalaspectsofIPRlaws,NeedforIPR,IPRasaninstrumentofdevelopment	05				
02	 EnforcementofIntellectualPropertyRights:Introduction,Magnitudeofproblem,Fac torsthatcreateandsustaincounterfeiting/piracy,Internationalagreements,Internationalo rganizations(e.g.WIPO,WTO)activeinIPRenforcement Indian Scenario of IPR:Introduction, History ofIPR inIndia, Overview ofIPlaws in India, Indian IPR, Administrative Machinery, Major international treatiessignedbyIndia,ProcedureforsubmittingpatentandEnforcementofIPRat nationalleveletc 					
03	EmergingIssuesinIPR: ChallengesforIPindigitaleconomy,e-commerce, humangenome, biodiversityand traditional knowledgeetc.	05				
04	Basics ofPatents: Definition of Patents, Conditions of patentability, Patentable and non-patentable inventions, Types of patenta pplications (e.g. Patentof additionetc), Process Patentand Product Patent, Precautions while patenting, Patents pecification	07				

	Patentclaims, Disclosures and non-disclosures, Patentrights and infringement,						
	Methodofgetting apatent						
	PatentRules: Indianpatentact, Europeanscenario, US scenario, Australia						
05	05 scenario, Japanscenario, Chinesescenario, Multilateraltreaties where Indiaisamember (T						
	RIPS agreement, Paris convention etc.)						
	Procedure for Filing a Patent (National and International):Legislation						
	andSalient Features, Patent Search, Drafting and Filing Patent Applications,						
06	Processing of patent, Patent Litigation, Patent Publication etc, Time frame and cost,	07					
	PatentLicensing,PatentInfringement						
	Patentdatabases: Importantwebsites, Searchinginternational databases						

Outcomes:

Studentswillbeable to...

- understand IntellectualPropertyassets
- assistindividuals and organizations in capacity building
- workfor
 - development, promotion, protection, compliance, and enforcement of Intellectual Property and Patent

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or at least 6 assignment on complete syllabus or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentionin thesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $\label{eq:constraint} 3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) and$
- (b)will befrom anymodule other than module3)
- 4. OnlyFourquestion needtobe solved.

ReferenceBooks:

- 1. RajkumarS.Adukia,2007,AHandbookonLawsRelatingtoIntellectualPropertyRightsinIndia,TheInstitu teof Chartered Accountants ofIndia
- 2. KeaylaBK,Patentsystemandrelatedissuesataglance,PublishedbyNationalWorkingGrouponPatentLaw s
- 3. TSengupta,2011,IntellectualPropertyLawinIndia,KluwerLawInternational
- 4. TzenWongandGrahamDutfield,2010,IntellectualPropertyandHumanDevelopment:CurrentTrendsand FutureScenario, CambridgeUniversityPress
- 5. Cornish,WilliamRodolph&Llewelyn,David.2010,IntellectualProperty:Patents,Copyrights,TradeMar ks and AlliedRight, 7thEdition,Sweet &Maxwell
- 6. LousHarns, 2012, The enforcement of Intellactual Property Rights: A Case Book, 3rd Edition, WIPO
- 7. PrabhuddhaGanguli,2012,IntellectualPropertyRights,1stEdition,TMH
- 8. RRadhaKrishnan &SBalasubramanian,2012,IntellectualPropertyRights,1stEdition,ExcelBooks

- 9. MA shok Kumar and mohd Iqbal Ali, 2-11, Intellectual Property Rights, 2nd Edition, Serial Publications
- $10.\ Kompal Bansal and Praishit Bansal, 2012, Fundamentals of IPR for Engineers, 1 st Edition, BSP ublications and Praishit Bansal, 2012, Fundamental sof IPR for Engineers, 1 st Edition, BSP ublications and Praishit Bansal, 2012, Fundamental sof IPR for Engineers, 1 st Edition, BSP ublications and Praishit Bansal, 2012, Fundamental sof IPR for Engineers, 1 st Edition, BSP ublications and Praishit Bansal, 2012, Fundamental sof IPR for Engineers, 1 st Edition, BSP ublications and Praishit Bansal, 2012, Fundamental sof IPR for Engineers, 1 st Edition, BSP ublications and Praishit Bansal, 2012, Fundamental sof IPR for Engineers, 1 st Edition, BSP ublications and Praishit Bansal, 2012, Fundamental sof IPR for Engineers, 1 st Edition, BSP ublications and 2 st Edition, BSP ublication, BSP ublications and 2 st Editio$
- $11.\ Entrepreneurship Development and IPR Unit, BITSPilani, 2007, AM anual on Intellectual Property Rights, Nature 11.\ Statement and Statem$
- 12. Mathew Y Maa, 2009, Fundamentals of Patenting and Licensing for Scientists and Engineers, WorldScientificPublishingCompany
- 13. NSRathore,SMMathur,PritiMathur,AnshulRathi,IPR:Drafting,InterpretationofPatentSpecificationsan d Claims, NewIndia PublishingAgency
- 14. VivienIrish,2005,IntellectualPropertyRightsforEngineers,IET
- 15. HowardB Rockman, 2004, Intellectual Property Lawfor Engineers and scientists, Wiley-IEEE Press

SemesterII					
Course Code	Course Name	Credits			
WRIE2028	InstitutelevelElective:DigitalBusinessManagement	03			
TeachingScheme					

	ContactHours		Credit	sAssigned		
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

Theory					Termwork/Practical/Oral			
Inte	rnalAsse	essment	End	Durationof				TotalMarks
Test 1	Test2	Average	SemEx am	EndSem Exam	TW	PR	OR	i utanviai KS
20	20	20	80	03Hrs.				100

- Tofamiliarize with digital business concept
- ToacquaintwithE-commerce
- TogiveinsightsintoE-businessanditsstrategies

Module	Detailedcontent	Hrs
1	Introductionto Digital Business- Introduction,Backgroundandcurrentstatus,E- marketplaces,structures,mechanisms,economicsandimpacts Differencebetweenphysicaleconomyanddigitaleconomy, Driversofdigitalbusiness-BigData&Analytics,Mobile,CloudComputing,Socialmedia, BYOD, and Internet of Things (digitally intelligent machines/services)OpportunitiesandChallenges in DigitalBusiness,	09
2	 OverviewofE-Commerce E-Commerce- Meaning, Retailing in e-commerce-products and services, consumerbehavior,market research and advertisement B2B-E-commerce-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business EC andCorporateportals Other E-C models and applications, innovative EC System-From E-government andlearningto C2C, mobilecommerceand pervasivecomputing ECStrategyandImplementation-ECstrategyandglobalEC,EconomicsandJustification of EC, Using Affiliate marketing to promote your e-commerce business,Launching a successful online business and EC project, Legal, Ethics and Societalimpactsof EC 	06
3	DigitalBusinessSupportservices :ERPas e–businessbackbone, knowledgeTopeApps, Informationandreferral system ApplicationDevelopment: BuildingDigitalbusinessApplicationsand Infrastructure	06
4	Managing E-Business-Managing Knowledge, Management skills for e- business, Managing Risks in e-business SecurityThreatstoe-business- SecurityOverview, ElectronicCommerceThreats, Encryption, Cryptography, PublicKeya	06

ndPrivateKeyCryptography,Digital	

	Signatures, Digital Certificates, Security Protocolsover	
	PublicNetworks:HTTP,SSL,FirewallasSecurityControl,PublicKeyInfrastructure(PKI)fo	
	rSecurity,Prominent	
	CryptographicApplications	
	E-BusinessStrategy-E-businessStrategicformulation-AnalysisofCompany's	
5	Internaland externalenvironment, Selection of strategy,	04
5	E-business strategy into Action, challenges and E-	04
	Transition(Processof Digital Transformation)	
6	Materializinge-business:FromIdeatoRealization-Businessplanpreparation	08
	CaseStudiesandpresentations	08

Outcomes:

Studentswill be ableto:

- Identifydriversofdigitalbusiness
- Illustratevariousapproachesandtechniques forE-businessandmanagement
- PrepareE-businessplan

Assessment: Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or at least 6 assignment on complete syllabus or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentioninthesyllabus.

- 1. Questionpaperwillcompriseoftotalsixquestion
- 2. Allquestion carryequalmarks
- $3. \ Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) and (c) an$
- (b)will befrom anymodule other than module3)
- 4. OnlyFour questionneed to besolved.

- 1. A textbook on E-commerce, ErArunrajan Mishra, Dr W K Sarwade, Neha Publishers & Distributors, 2011
- 2. E-commercefromvisiontofulfilment, EliasM.Awad, PHI-Restricted, 2002
- 3. DigitalBusinessandE-CommerceManagement,6th Ed,DaveChaffey,Pearson,August2014
- $4. \ Introduction to E-business-Management and Strategy, Colin Combe, ELSVIER, 2006$
- 5. DigitalBusinessConceptsandStrategy,EloiseCoupey, 2nd Edition,Pearson
- $6. \ \ Trend and Challenges in Digital Business \ Innovation, Vinocenzo Morabito, Springer$
- $7. \ Digital Business Discourse Erika Darics, April 2015, Palgrave Macmillan$
- E-Governance-ChallengesandOpportunitiesin:Proceedingsin2ndInternationalConferencetheoryandpracticeof ElectronicGovernance
- 9. PerspectivestheDigitalEnterprise-AframeworkforTransformation,TCSconsultingjournalVol.5
- 10. MeasuringDigitalEconomy-Anewperspective-DOI: <u>10.1787/9789264221796-en</u>OECDPublishing

SemesterII					
CourseCode	CourseName	Credits			
WRIE2029	InstitutelevelElective: Environmental Management	03			

TeachingScheme

	ContactHours		Credi	tsAssigned		
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

EvaluationScheme

Theory					Termwork/Practical/Oral			
Inter	InternalAssessment			Durationof				TatalMarks
Test1	Test2	Average	SemEx am	EndSem Exam	TW	PR	OR	i otanviai KS
20	20	20	80	03Hrs.				100

Objectives:

- Understandandidentifyenvironmentalissuesrelevantto India and globalconcerns
- Learnconceptsofecology
- Familiarizeenvironmentrelatedlegislations

Module	DetailedContents	Hrs			
I	Introduction and Definition of Environment: Significance of EnvironmentManagementfor contemporarymanagers, Careeropportunities. EnvironmentalissuesrelevanttoIndia,SustainableDevelopment,TheEnergy scenario.	10			
II	GlobalEnvironmentalconcerns:GlobalWarming,AcidRain,OzoneDepletion,Hazardous Wastes, Endangered life-species, Loss of Biodiversity,Industrial/Man-madedisasters, Atomic/Biomedical hazards, etc.	06			
III	ConceptsofEcology:Ecosystemsandinterdependencebetweenlivingorganisms, habitats,limitingfactors,carryingcapacity,foodchain,etc.				
IV	ScopeofEnvironmentManagement,Role&functionsofGovernmentasaplanningandregul atingagency. EnvironmentQualityManagement andCorporateEnvironmental Responsibility				
V	TotalQualityEnvironmentalManagement,ISO-14000,EMScertification.	05			
VI	General overview of major legislations like Environment Protection Act, Air (P & CP) Act, Water (P & CP) Act, Wildlife Protection Act, Forest Act, Factories Act, etc.	03			

ContributiontoOutcomes

Studentswillbeable to...

- Understandthe conceptofenvironmentalmanagement
- Understandecosystemandinterdependence,foodchainetc.
- Understandandinterpret environmentrelatedlegislations

<u>Assessment</u>:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

EndSemesterTheoryExamination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in questionpapers of end semester examination. In question paper weightage of each module will be proportional tonumberofrespectivelecturehours asmentionin thesyllabus.

- 1. Question paper will comprise of total six question
- 2. All question carry equal marks
- 3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
- 4. Only Four question need to be solved.

- 1. EnvironmentalManagement:PrinciplesandPractice,CJBarrow,RoutledgePublisher s London,1999
- 2. AHandbookofEnvironmentalManagementEditedbyJonC.LovettandDavidG.O ckwell,EdwardElgar Publishing
- 3. EnvironmentalManagement,T V RamachandraandVijayKulkarni, TERIPress
- IndianStandardEnvironmentalManagementSystems— RequirementsWithGuidanceForUse,BureauOfIndian Standards, February2005
- 5. EnvironmentalManagement:AnIndianPerspective,SNCharyandVinodVyasulu, MaclillanIndia,2000
- 6. IntroductiontoEnvironmentalManagement,MaryKTheodoreand Louise Theodore,CRCPress
- 7. EnvironmentandEcology,MajidHussain,3rd Ed. AccessPublishing.2015

SemesterII					
Course Code	Course Name	Credits			
WREL201	Program Lab-II	02			

TeachingScheme						
ContactHours			CreditsAssigned			d
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
	2			1		02

	EvaluationScheme							
Theory					Term Work/Practic al/Oral			Total
Interna Test1	dAssessn Test2	nent Average	EndSDurationemExofEndamSemExam		TW	PR	OR	
					25		25	50

Sr.	Content
No	
1	Rainfall data collection by natural siphon recording type rain gauge and determination of
	mass curve & hyetograph from obtained data and its analysis.
2	Determination of ϕ index by double ring type infiltrometer and its significance.
3	Measurement of permeability of soil and analysis
4	Determination of rate of evaporation
5	Measurement of Water quality parameters
6	Study and analysis of pumping test well (expected to perform test on well)
7	Design of rain water harvesting system

	SemesterII	
Course Code	Course Name	Credits
WRESBL201	Skill Based Lab-II	02

TeachingScheme						
Cont	CreditsAssigned					
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
	4			2		02

	EvaluationScheme							
Theory					Term			
					al/Oral		Total	
InternalAssessment		EndS	Duration					
			emEx	ofEnd	TW	PR	OR	
Test1	Test2	Average	am	SemE				
				xam				
					50		50	100

Candidates are expected to perform minimum six assignments, and submit reports as bonafide documents to supervisor/course instructor for each assignment. The assignment may be in the form of modeling/ simulation/ programming/ experimental investigation/ fieldwork as detailed below:

Sr. No	Content				
1	Assignment based on dam break problem or model study on a hydraulic structure or open				
	channel and detailed analysis.				
2	Design any type of innovative irrigation scheme				
3	Employ Remote sensing and any GIS software for water resource planning of a region				
4	Visit to ahydraulic structures& preparation of visit report.				
5	Assignments based on stability analysis of gravity/earth/rockfill dams.				
6	Development of computer program to solve pipe network problem				
7	Application of spreadsheet, XLSTAT, SPSS and similar softwares used for prediction/simulation of runoff/floods for downstream regions during monsoon and non-monsoon seasons				
8	Summarizing two articles related to water resources engineering from reputed technical				
	journals				

Contribution to Outcomes

Students will be able to:

- Write effective project reports highlighting the pros & cons of the technologies envisaged for the project
- Apply spreadsheet (excel or other) tools to simplify complex civil engineering problems
- Employ Remote sensing and any GIS software for water resource planning of a region
- Design irrigation systems
- Use softwares to address issues in water resources management

• Summarize technical articles and write technical papers in reputed journals