PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY

PERIYAR MANIAMMAI
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University)
Established Under Sec. 3 of UGC Act, 1956 • NAAC Accredited
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Criterion 1 – Curricular Aspects

Key Indicator	1.3	Curriculum Enrichment
Metric	1.3.1	***Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum***

List and description of the courses which address the Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

2021-22 ACADEMIC YEAR

Index

I. LIST OF COURSES - DEPARTMENT WISE CONSOLIDATED LIST

Note: Repeated courses are given **in red color** and syllabus is given only once

1.	Architecture	1. XAR402 - Climate and Architecture 2. XAR502 Environmental Sciences 3. XAR601 Vernacular Architecture 4. XAR 701 Urban Economics & Sociology 5. XAR 704 B Disaster Resistance in Architecture 6. XAR 903A Architectural Conservation 7. XAR 904B Landscape Architecture 8. Behavioral studies in Built Environment 9. YAR102 Appropriate Materials and Technology for Sustainable Architecture 10. YAR103 Advanced Studies in Regional and Vernacular Architecture 11. YAR 301 Sustainable Urban Landscape 12. YAR 302 Heritage Conservation Planning 13. YAR 303 Urban Design Practices 14. YAR 304B Energy Simulation and Modelling 15. YAR ON06 Rethink The City: New Approaches To Global And Local Urban Challenges
2.	Aerospace Engineering	1. XUM106 Constitution of India 2. XUM403 Human Ethics, Values, Rights and Gender Equality 3. XUM507 Essence of Indian Traditional Knowledge 4. XUM607 Constitution of India 5. XUM706 Cyber Security
3.	Biotechnology	1. XUM106 Constitution of India 2. XUM 306 Human Ethics 3. XUM307 Universal Human Values 2: 4. Understanding Harmony 5. XUME 706 Cyber Security 6. XBT OE 1 Intellectual Property Rights 7. XBTOE 2 Industrial safety and Risk Management
4.	Civil Engineering	1. XUM106 Constitution of India 2. XCE302 Disaster Preparedness & Planning 3. XCE305 Energy Science and Engineering 4. XUM506 Constitution of India 5. XCE509 Professional Practice, Law & Ethics
5.	Mechanical Engineering	1. XUM106/XUM506 Constitution of India 2. XUM305 Entrepreneurship Development 3. XUM403 Human Ethics, Values, Rights and Gender Equality 4. XUM706 Cyber Security 5. XMEE04/XMEOE2 Renewable Energy Sources 6. XMEE06 Energy Conservation and Management

		7. XMEE19Total Quality Management 8. YRE101 Solar Energy Systems 9. YRE102 Wind energy, Tidal energy and OTEC 10. YRM107 Research Methodology and IPR 11. YEGOE1 English for Research Paper Writing 12. YRE201 Bio Energy Systems 13. YPSOE1 Constitution of India 14. YRE104C Fuels and Combustion Technology 15. YRE105A Environmental Engineering 16. YRE105B Carbon Sequestration And Trading 17. YRE105C Waste Management and Energy Recovery 18. YRE204A Optimum Utilization of Heat and Power 19. YRE204C Sustainable Development 20. YRE205B Hydrogen and Nuclear energy 21. YRE302A Energy Audit and Management 22. YREOE1 Hydro Power Technology 23. QRE101 Solar Energy Systems 24. QRE102 Wind Energy, Tidal Energy and OTEC 25. QRE201 Bio Energy Systems 26. QRE202 Research Methodology and IPR 27. QRE103A Fuels and combustion technology 28. QRE103B Waste Management and Energy Recovery 29. QRE203A Hydro Power Technology 30. QRE203B Optimum Utilization of heat and power 31. QRE203C Environmental Engineering 32. PYRE303C Sustainable Development 33. PYRE401A Hydrogen and Nuclear Energy 34. PYREOE1A Energy Audit and Management 35. PYREOE1B Carbon Sequestration And Trading
6.	Electrical and Electronics Engineering	1. XUM106 Constitution of India 2. XUM405 Entrepreneurship Development 3. XUM506 Constitution of India 4. XUM601 Economics for Engineers 5. XUM606 Disaster Management 6. XUM703 Human Ethics,Values,Rights and Gender Equality 7. XUM801 Cyber Security
7.	Electronics and Communication Engineering/ Division of Nanotechnology	1. XUM106 Constitution of India 2. XUM306 Constitution of India 3. XUM403 Human ethics, values, rights and gender equality 4. XUM701 Cyber Security
8.	Computer Science and Engineering	1. XUM106 Constitution of India 2. XUM606 Economics for Engineers 3. XUM705 Disaster Management

9.	Computer Science and Application	1. XUMA302 Environmental Sciences 2. XUMA106 Human Ethics, Values, Rights and Gender Equality 3. XUM306 Disaster Management
10.	Software Engineering	1. XUM106 Human Ethics, Values, Rights and Gender Equality 2. XUMA306 Disaster Management 3. XES202 Environmental Sciences
11.	Physics	1. XUMA106 Human Ethics, Values, Rights, and Gender Equality 2. XUMA202 Environmental Science 3. XUM306 Disaster Management
12.	Chemistry	1. XUM106 Human Ethics, Values, Rights and Gender Equality 2. XUMA306 Disaster Management 3. XES202 Environmental Sciences
13.	Mathematics	1. XUM106 Human Ethics, Values, Rights and Gender Equality 2. XUMA306 Disaster Management 3. XES202 Environmental Sciences
14.	Education	1. XBE403 Social Engineering 2. XBE601 Indian Constitution and Human Rights
15.	Management Studies	1. XES202 Environmental Sciences 2. XUM106 Human Ethics, Values, Rights and Gender Equality 3. XUMA306 Disaster Management
16.	English	NIL
17.	Commerce	1. XUMA202 Environmental Sciences 2. XUMA106 Human Ethics, Values, Rights and Gender Equality 3. XUMA301 Disaster Management 4. YCO102 Business Ethics, Corporate Social Responsibility and Governance
18.	Political Science	NIL
19.	Social Work	NIL

II. DESCRIPTION OF COURSES - COURSE SYLLABUS

SUBCODE	SUB NAME	L	T	P	C
XAR 402	CLIMATE AND ARCHITECTURE	3	0	0	3
C:P:A	0.6:1.2:1.2	L	T	P	H
		3	0	0	3
UNIT – I	CLIMATE AND THERMAL SENSATION				10
	Factors that determine climate - Components of climate - Characteristics of climate types, Building design Approaches- Body heat balance - Effective temperature - Comfort zone. Exercises on Mahoney chart, Comfort zone calculation, etc.,				
UNIT – II	SOLAR CONTROL				10
	Solar geometry - Solar chart – Sun path diagram - Sun angles and shadow angles. Design of solar shading devices.- Study projects, Shading device study models, etc.,				
UNIT – III	HEAT FLOW THROUGH BUILDING MATERIALS				7
	Basic principles of Heat Transfer, Performance and properties of different materials-calculation of 'U' value - Time lag and decrement of building elements-Study projects				
UNIT – IV	AIR MOVEMENT				8
	Wind rose - Wind shadows -The effects of topography on wind patterns - Air movement around and through buildings -The use of fans - Stack effect -Venturi effect - Thermally induced Air currents – Use of court yard.				
UNIT – V	SHELTER DESIGN IN TROPICS				10
	Design considerations for warm humid, hot dry, composite and upland climates, Heavy rainfall regions. Landscape and climatic design. Mini projects in relation with Architectural Design				
	LECTURE	TUTORIAL	PRACTICAL	TOTAL	
	45	0	0	45	

TEXT

1. O.H. Koenigsberger and Others, “Manual of Tropical Housing and Building” – Part I -Climate design, Orient Longman, Madras, India, 2010.
2. Bureau of Indian Standards IS 3792, “Hand book on Functional requirements of buildings other than industrial buildings”, 1987.

REFERENCES

1. Galloe, Salam and Sayigh A.M.M., “Architecture, Comfort and Energy”, Elsivier Science Ltd., Oxford, U.K., 1998.
2. M.Evans- Housing, Climate and Comfort - Architectural Press, London, 1980.
3. B.Givoni, Man, Climate and Architecture, Applied Science, Banking, Essex,198.
4. Donald Watson and Kenneth Labs., Climatic Design - McGraw Hill BookCompany- New York - 1983.
5. B. Givoni, “Passive and Low Energy Cooling of building”, Van Nortrand Reinhold New York, USA,

1994.

e- REFERENCES

1. http://www.envinst.conu.edu/~envinst/research/built.html
2. www.terin.org/
3. http://www.pge.com/pec/archives/w98 passi.html
4. http://solstice.crest.org/efficiency/index.shtml

SUBCODE	SUB NAME	L	T	P	C
XAR 502	ENVIRONMENTAL SCIENCES	3	0	0	3

C:P:A	3:0:0	L	T	P	H
		3	0	0	3

UNIT – I	**IINTRODUCTION TO ENVIRONMENTAL STUDIES AND ENERGY**	**12**

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, flood, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT – II	**ECOSYSTEMS AND BIODIVERSITY**	**7**

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III	**ENVIRONMENTAL POLLUTION**	**10**

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: flood, earthquake, cyclone and landslide.

UNIT – IV	**SOCIAL ISSUES AND THE ENVIRONMENT**	**10**

Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT– V	HUMAN POPULATION AND THE ENVIRONMENT	6

Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education - HIV / AIDS – Women and Child welfare programme– Role of Information Technology in Environment and human health – Case studies.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	0	0	45

TEXT

1. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co, USA, 2000.
2. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, UK, 2003
3. Trivedi R.K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, India, 2003
4. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, 2006.
5. Introduction to International disaster management, Butterworth Heinemann, 2006.
6. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, New Delhi, 2004.

REFERENCES

1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media, India, 2009.
2. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
3. S.K.Dhameja, Environmental Engineering and Management, S.K.Kataria and Sons, New Delhi, 2012.
4. Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, 2003.
5. Sundar, Disaster Management, Sarup& Sons, New Delhi, 2007.
7. G.K.Ghosh, Disaster Management, A.P.H.Publishers, New Delhi, 2006.

e- REFERENCES

1. http://www.e-booksdirectory.com/details.php?ebook=10526
2. https://www.free-ebooks.net/ebook/Introduction-to-Environmental-Science
3. https://www.free-ebooks.net/ebook/What-is-Biodiversity
4. https://www.learner.org/courses/envsci/unit/unit_vis.php?unit=4
5. http://bookboon.com/en/pollution-prevention-and-control-ebook
6. http://www.e-booksdirectory.com/details.php?ebook=8557
7. http://www.e-booksdirectory.com/details.php?ebook=6804
8. http://bookboon.com/en/atmospheric-pollution-ebook
9. http://www.e-booksdirectory.com/details.php?ebook=3749
10. http://www.e-booksdirectory.com/details.php?ebook=2604
11. http://www.e-booksdirectory.com/details.php?ebook=2116
12. http://www.e-booksdirectory.com/details.php?ebook=1026

SUBCODE	SUB NAME	L	T	P	C
XAR601	VERNACULAR ARCHITECTURE	3	0	0	3

C:P:A	2.5:0.5:0	L	T	P	H
		3	0	0	3
UNIT – I	**INTRODUCTION**				**7**
	Definition and classification of Vernacular architecture – Vernacular architecture as a process – Survey and study of vernacular architecture: methodology- Cultural and contextual responsiveness of vernacular architecture: an overview				
UNIT – II	**APPROACHES AND CONCEPTS**				**10**
	Different approaches and concepts to the study of vernacular architecture: an over view – Aesthetic, Architectural and anthropological studies in detail				
UNIT – III	**VERNACULAR ARCHITECTURE OF THE WESTERN AND NORTHERN REGIONS OF INDIA**				**12**
	Forms spatial planning, cultural aspects, symbolism, colour, art, materials of construction and construction technique of the vernacular architecture of the following: - Deserts of Kutch and Rajasthan; Havelis of Rajasthan - Rural and urban Gujarat; wooden mansions (havelis); Havelis of the Bohra Muslims - Geographical regions of Kashmir; house boats.				
UNIT – IV	**VERNACULAR ARCHITECTURE OF SOUTH INDIA**				**10**
	Forms, spatial planning, cultural aspects, symbolism, art, colour, materials of construction and construction technique, proportioning systems, religious beliefs and practices in the vernacular architecture of the following: - Kerala: Houses of the Nair &Namboothri community; Koothambalam, Padmanabhapuram palace. - Tamil Nadu: Houses and palaces of the Chettinad region; Agraharams				
UNIT – V	**WESTERN INFLUENCES ON VERNACULAR ARCHITECTURE OF INDIA**				**6**
	Colonial influences on the Tradition Goan house - Evolution of the Bungalow from the traditional bangla, Victoria Villas – Planning principles and materials and methods of construction. Settlement pattern and house typologies in Pondicherry and Cochin.				
	LECTURE	**TUTORIAL**	**PRACTICAL**	**TOTAL**	
	45	**0**	**0**	**45**	

TEXT

1. Paul Oliver, Encyclopedia of Vernacular Architecture of the World, Cambridge University Press, 1997.
2. Amos Rapoport, House, Form & Culture, Prentice Hall Inc. 1969.
3. R W Brunskill: Illustrated Handbook on Vernacular Architecture, 1987.

REFERENCES

1. V.S. Pramar, Haveli – Wooden Houses and Mansions of Gujarat, Mapin Publishing Pvt. Ltd., Ahmedabad, 1989.
2. Kulbushanshan Jain and Minakshi Jain – Mud Architecture of the Indian Desert, Aadi Centre,

Ahmedabad 1992. 63
3. G.H.R. Tillotsum – The tradition of Indian Architecture Continuity, Controversy – Change since 1850, Oxford University Press, Delhi, 1989.
4. Carmen Kagal, VISTARA – TheArchitecture of India, Pub: The Festival of India, 1986.
5. S. Muthiah and others: The Chettiar Heritage; Chettiar Heritage 2000

XAR 701- URBAN ECONOMICS & SOCIOLOGY

SUBCODE	SUB NAME	L	T	P	C

XAR 701	URBAN ECONOMICS & SOCIOLOGY	2	0	0	2
C:P:A	1:1:3	L	T	P	H
		2	0	0	2

UNIT – I ROLE OF URBAN ECONOMICS &SOCIOLOGY — 5

Subject matter of Economics and Sociology as related to built environment.

UNIT – II URBAN ECONOMICS — 6

Principles of consumption, production and distribution and their relevance's; market demand and supply and price changes, laws of returns and urban land values, built environment and municipal taxes.

UNIT - III COMPONENTS OF PLANNING — 8

Various aspects of planning - Land use planning, transportation planning, environmental planning, infrastructure planning. The fundamentals of the land use planning, Zoning principles and basis for formation of zoning laws. Growth management system, infrastructure (Infrastructure, Road, Water supply, Sanitation, Solid Waste Disposal) development and maintenance - Forecasting infrastructure needs of the town based on set of parameters such as population and size of the city, growth trend.Development Control Regulations and bye-laws, standards, CZR in India. Critical analysis of standards. ICT in city management.

UNIT - IV URBAN PLANNING AND URBAN RENEWAL — 6

Tools and techniques utilized at the local, regional, and state level –master plan, structure plan, and zonal plan. Local Governance and Administration: Objectives, Functions, Responsibilities and Organizational structure of: (i) Village Panchayats (ii) Municipalities (iii) Corporations and (iv) Urban Development Authorities.Urban Renewal Plan – Meaning, Redevelopment, Rehabilitation and Conservation – Govt.schemes – case studies.

UNIT - V CITIES -PARADIGM OF SOCIO POLITICAL EXPRESSION — 5

Self sustained communities – SEZ – transit development – integrated townships – case studies.Cities as symbolic expressions of power – Chandigarh, Delhi, Bhubaneshwar, Brasilia, Regulations and standards in India. Critical analysis of standards.

	LECTURE	TUTORIAL	PRACTICAL	TOTAL
	30	0	0	30

TEXT

1. Gallion Arthur B &Eisna Simon, The Urban Pattern: City Planning and Housing.
2. UDPFI guidelines
3. Town and Country Planning Act 1971with amendments
4. John Radcliffe, An Introduction to Town and Country Planning.

REFERENCES

1. C.L.Doxiadis, Ekistics, "An Introduction to the Science of Human Settlements", Hutchinson, London, 1968.
2. Government of India, "Report of the National Commission on Urbanisation", 1988.
3. AndroD.Thomas, "'Housing and Urban Renewal", George Allen and Unwin, Sydney, 1986.

4. Rodwin, Lloyd, ed., 1987. Shelter, Settlements and Development (Hemel Hempstead, United Kingdom, Unwin Hyman Ltd.)
5. Town and country planning Act 1971 with amendments

XAR 704B DISASTER RESISTANT IN ARCHITECTURE

Course objectives:

1. To understand the fundamentals of Earthquake and the basic terminology
2. To provide basic knowledge of earthquake resistant design concepts.
3. To inform the performance of ground and buildings.
4. To familiarize the students with design codes and building configuration
5. To understand the various types of construction details to be adopted in a disaster prone area.

SUBCODE	SUB NAME	L	T	P	C
XAR 704 B	DISASTER RESISTANT IN ARCHITECTURE	3	0	0	3
C:P:A = 0.6:0.8:0.8					
		L	T	P	H
		3	0	0	3

UNIT I NATURAL HAZARDS AND MAN MADE HAZARDS	9
Introduction to Disaster Management – Contemporary, Natural and Man-made Disasters- Natural Hazards – Fundamentals of Disasters, Causal Factors of Disasters, Poverty, Population Growth, Rapid Urbanization, Transitions in Cultural Practices, Environmental Degradation, War and Civil Strife - brief description on cause and formation of flood, cyclone, earthquake, Tsunami and Landslides. Zoning and classification by center/ state government organizations. Geologic Hazards and Natural disasters – how to recongnize and avoid them – hazards of faulting – hazards of geologic foundations. Man made hazards – fire, gas and chemical leakages, pollution and health hazards, manmade disasters – vulnerability analysis and risk assessment	
UNIT II CONCEPTS FOR DISASTER RESISTANT DESIGN	**9**
Vernacular and historical experiences – case studies. Site selection and site development – building forms – Effects of cyclone, tsunami, hurricanes and seismic forces related to building configuration – spatial aspects – contemporary/ international approaches for low rise, mid-rise and high rise buildings. Innovations and selection of appropriate materials – IS code provisions for buildings – disaster resistant construction details.	
UNIT III FUNDAMENTALS OF EARTHQUAKE AND BUILDING CONFIGURATION	**9**
Fundamentals of earthquakes - Earths structure, seismic waves, plate tectonics theory, origin of continents, seismic zones in India- Predictability, intensity and measurement of earthquake - Basic terms- fault line, focus, epicentre, focal depth etc. Site planning, performance of ground and buildings - Historical experience, site selection and development - Earthquake effects on ground, soil rupture, liquefaction, landslides- Behaviour of various types of building structures, equipments, lifelines, collapse patterns - Behaviour of non-structural elements like services, fixtures in earthquake - prone zones Seismic design codes and building configuration - Seismic design code provisions – Introduction to Indian codes- Building configuration- scale of building, size and horizontal and vertical plane, building proportions, symmetry of building- torsion, re-entrant corners, irregularities in buildings- like short stories, short columns etc.	

UNIT IV EARTHQUAKE RESISTANT DESIGN	8
Various types of construction details a) Seismic design and detailing of non-engineered construction-masonry structures, wood structures, earthen structures. b) Seismic design and detailing of RC and steel buildings c) Design of non-structural elements- Architectural elements, water supply, drainage, electrical and mechanical components	
UNIT V POST OPERATIVE MEASURES FOR DISASTER MANAGEMANT	**10**
Methods to minimize damage to utilities – plaster / wall boards / furnishings/ swimming pools / antennas / free standing retaining masonry walls other remedies and post operative measures – cyclone and earthquake insurance – training for before and after natural hazards and ways to protect family, property and oneself from natural calamities. Role of international, national and state bodies – CBRI, NBO and NGOs in disaster mitigation and community participation.	

	LECTURE	TUTORIAL	PRACTICAL	TOTAL
	45	**0**	**0**	**45**

TEXT

1. Guidelines for earthquake resistant non-engineered construction, National Information centre of earthquake engineering (NICEE, IIT Kanpur, India), 2004.
2. C.V.R Murthy, Andrew Charlson. “Earthquake design concepts”, NICEE, IIT Kanpur, 2006.
3. Agarwal.P, Earthquake Resistant Design, Prentice Hall of India, 2006.

REFERENCES

1. Ian Davis, “Safe shelter within unsafe cities: Disaster vulnerability and rapid urbanization”, Open House International, UK, 1987
2. Socio-economic developmental record- Vol.12, No.1, 2005
3. Mary C. Comerio, Luigia Binda, “Learning from Practice- A review of Architectural design and construction experience after recent earthquakes” - Joint USA-Italy workshop, Oct.18-23, 1992, Orvieto, Italy.

XAR903A ARCHITECTURAL CONSERVATION 3 - 0 – 0 - 3

SUBCODE	SUB NAME	L	T	P	C
XAR 903A	**ARCHITECTURAL CONSERVATION**	**3**	**0**	**0**	**3**
C:P:A	2.4:.6:0				
		L	**T**	**P**	**H**
		3	**0**	**0**	**3**

UNIT – I INTRODUCTION TO CONSERVATION **9**

Understanding Heritage. Types of Heritage. Heritage conservation- Need, Debate and purpose. Defining Conservation, Preservation and Adaptive reuse. Distinction between Architectural and Urban Conservation. International agencies like ICCROM, UNESCO and their role in Conservation

UNIT – II CONSERVATION IN INDIA **9**

Museum conservation – monument conservation and the role of Archeological Survey of India – role of INTACH – Central and state government policies and legislations – inventories and projects- select case studies of sites such as Hampi, Golconda, Mahabalipuram - craft Issues of conservation

UNIT – III CONSERVATION PRACTICE **9**

Listing of monuments- documentation of historic structures- assessing architectural character – historic structure report- guidelines for preservation, rehabilitation and adaptive re-use of historic structures- Case studies of Palaces in Rajasthan, Chettinad and Swamimalai dwellings, seismic retrofit and disabled access/ services additions to historic buildings-heritage site management

UNIT – IV URBAN CONSERVATION **9**

Over view of urban history of India and Tamil Nadu- understanding the character and issues of historic cities – select case studies of towns like Srirangaram, Kumbakonam and Kanchipuramhistoric districts and heritage precincts.

UNIT – V CONSERVATION PLANNING **9**

Conservation as a planning tool.- financial incentives and planning tools such as Transferable Development Right(TDR)-urban conservation and heritage tourism-case studies of sites like for Cochin, Pondichery French town.- conservation project management.

	LECTURE	**TUTORIAL**	**PRACTICAL**	**TOTAL**
	45	0	0	45

TEXT

1. Donald Appleyard, “The Conservation of European Cities”, M.I.T. Press, Massachusetts, 1979.
2. James M. Fitch, “ Historic Preservation: Curatorial Management of the Built World” University Press of Virginia; Reprint edition, 1990

3. Robert E. Stipe, A Richer Heritage: Historic Preservation in the Twenty-First Century" , Univ. of North Caroling press, 2003.

4. Conservation Manual , Bernard Fielden; INTACH Publication, 1989.

REFERENCES

1. B.K. Singh, "State and Culture", Oxford, New Delhi

2. A.G. K. Menon ed. "Conservation of Immovable Sites", INTACH Publication, N.Delhi., 1988

3. Seminar Issue on Urban Conservation

XAR 904 B LANDSCAPE ARCHITCTURE **3 – 0 – 0 – 3**

OBJECTIVES:

To familiarize students with the various elements, principle of landscape architecture and develop competency in dealing with the analytic, artistic and technical aspects of landscape design

SUBCODE	SUB NAME	L	T	P	C
XAR 904B	**LANDSCAPE ARCHITECTURE**	**3**	**0**	**0**	**3**
C:P:A = 1.2:1.8:0					
		L	**T**	**P**	**H**
		3	**0**	**0**	**3**

UNIT – I INTRODUCTION **6**

Introduction to ecology, ecosystem, biosphere – components and working mechanism of ecosystem – types and courses of disturbance in ecosystem – man-made and natural e.g.Dereliction of land – reclamation, conservation and landscaping of derelict land.

UNIT – II PLANTING DESIGN **9**

Plants as design elements- classification – structural characteristic of plants – visual characteristics of plant viz. line, form, texture, colour, etc. – basic data for plant selection.

UNIT – III ELEMENTS IN LANDSCAPE DESIGN **10**

ape design - Landscape character – Landscape Composition – Plant Association– Landscape effects- on of spaces- circulation, built form and open spaces- exercises on planning for neighbourhood parks and evelopments.**Design Assignment:** Plant selection and composition for given situation.

UNIT – IV HISTORY OF GARDEN DESIGN **10**

rinciples and design – historic styles – Mugal gardens of India: Shalimar Bagh and Japanese gardens: Saihoji, Ryoanji&Katsura imperial palace, Italian Renaissance Villa Lante at Bagania.

ng for residential layout – recreational facilities, like parks, play fields- water front l areas – urban centers like squares, plazas , Consideration and key factors to ng of above context.

ssignment : Landscape proposal and Drawing preparation for assigned project

	LECTURE	TUTORIAL	PRACTICAL	TOTAL
	45	**0**	**0**	**45**

TEXT

Landscape Architecture – John Omsbeesimonds .

lanting Design – Theodore D Walker.

REFERENCES

1. Introduction to landscape design – John L.Motloch.
2. Planting design Handbook – Nick Robinson.
3. Site planning Standards – Joseph dechiara Lee E. Koppelman.
4. Hand Book of Urban Landscape, The Architectural Press, London, 1973, Cliff Tandy.
5. T S S for Landscape Architecture, McGraw Hill, Inc, 1995

6. Landscape planning and Environmental Impact Design , Turner
7. Landscape detailing , Little woods
8. Landscape design , Park C.

SUBCODE	SUB NAME	L	T	P	C

XAR 904C	**BEHAVIOURAL STUDIES IN BUILT ENVIRONMENT**	**3**	**0**	**0**	**3**
C:P:A = 1.2:.6:1.2					
		L	**T**	**P**	**H**
		3	**0**	**0**	**3**

UNIT – I CONCEPTS AND CONCERNS OF PERCEPTION **9**

Definition - Visual perception - perceptual constancy, objective and spatial vision, attention and awareness, methods of vision perception and science.

UNIT – II DEVELOPING SENSIVITY TO THE NEEDS OF USERS AND CLIENTS **8**

Architectural assumptions and Environmental Designs, Designs and social practices, involvement of clients and user in Designs and built environment, realities of clients and public their impact projects and designs.

UNIT – III DESIGNING AND PLANNING FOR URBAN QUALITY **10**

Quality of urban environment and living - past, present and futuretrends, role of urban design in urban environment, planning for quality living in urban areas,

UNIT – IV MICRO AND MACRO BUILT ENVIRONMENT AND BEHAVIORALASPECTS **9**

Relationship of built environment to society, spatial relationship within built - environment, influence of physical environment on human behavior, influences of built environment on human behaviour.

UNIT – V BUILT - ENVIRONMENT AND PERCEPTION **9**

Case studies of tall buildings, low raise neighborhoods, interior and exterior elegance of built environment, local and regional level landscape.

	LECTURE	**TUTORIAL**	**PRACTICAL**	**TOTAL**
	45	**0**	**0**	**45**

TEXT

1. Parfeet M and Power G, Planning for urban quality, Rent ledge, London 1977.
2. JohathanBatnett - Urban Design as public polody - Haxper and row Publications New York, 1983

REFERENCES

1. Yantis .S (2001), Visual perception, Psychology Press, Philadelphia.
2. Nicol D and Pilling S (2000), changing Architectural education - Towards new propersimalism, Spon Press, London.
3. Frey H, (1999), Eand FN Spon, London.
4. Dovey K, (1999) Framing Places, meditiating power in built form, Rent ledge, London.

SUBCODE	**SUB NAME**	**L**	**T**	**P**	**C**

YAR 102	**APPROPRIATE MATERIALS AND TECHNOLOGY FOR SUSTAINABLE ARCHITECTURE**	**3**	**0**	**0**	**3**
C:P:A	**1.8:0.0:1.2**	**L**	**T**	**P**	**H**
		3	**0**	**0**	**3**
UNIT – I	**INTRODUCTION**				**8**
	Architecture and the survival of the planet- Assessing patterns of consumption and their alternatives- Various definitions of sustainability, sustainability aspects of habitat design; sustainable buildings: principles, approaches and characteristics; Natural building movement –codes and regulations-LEED, GRIHA, etc.,				
UNIT – II	**SUSTAINABLE DESIGN PRINCIPLES**				**15**
	Principle 1: Conserving energy; Principle 2: Working with Climate; Principle 3: minimizing new resources; Principle 4: respect for users; Principle 5: respect for site; Principle 6: holism- Illustrated with examples				
UNIT – III	**SUSTAINABLE CONSTRUCTION PRACTICES**				**4**
	Design issues relating to sustainable development with respect to site and ecology, community and culture, health and well-being Design issues relating to sustainable development with respect to materials, energy, and water				
UNIT – IV	**SYSTEMS MATERIALS AND APPLICATIONS**				**10**
	Building technologies, traditional vs. modern; materials; Adobe- Cob- Rammed Earth- Modular contained earth- light clay- Straw bale- bamboo-earthen finishes, etc vs. modern materials like Fly ash bricks, hollow bricks, Aerated concrete blocks, reinforced polystyrene walls, Foam concrete; their sustainability; adaptability to climate; engineering considerations, and construction methods; Waste as a resource; Portable architecture, Applications through specific case studies				
UNIT – V	**CASE STUDIES FROM THE CONTEMPORARY SCENARIO**				**8**
	Ranging from small dwellings to large commercial buildings, drawn from a range of countries to demonstrate the best sustainable design				

LECTURE	**TUTORIAL**	**PRACTICAL**	**TOTAL**
45	**0**	**0**	**45**

TEXT

1. Sustainable Building design manual vol 1and 2 by TERI

REFERENCES

1. Vale Brenda and Robert; Green Architecture: Design for a sustainable future; Thames and Hudson;1996
2. Lynne Elizabeth and Cassandra Adams; Alternative Construction: Contemporary Natural Building Methods
3. Paola Sassi: Strategies for sustainable architecture by Taylor & Francis 2006
4. Kuppusami ayengar : sustainable architecture Design an overview: Routledge 2015
5. Portable Architecture- and unpredictable surroundings; Page One Publishing Pvt. Ltd.; 2005
6. Steve Goodhew: Sustainable construction processes- a resource text; Wiley Blackwell 2016

YAR103 – ADVANCED STUDIES IN REGIONAL AND VERNACULAR ARCHITECTURE

SUBCODE	SUB NAME	L	T	P	C
YAR103	ADVANCED STUDIES IN REGIONAL AND VERNACULAR ARCHITECTURE	3	0	0	3
C:P:A	1.8:0:1.2	L	T	P	H
		3	0	0	3

UNIT – I	**INTRODUCTION**	**5**
	A brief introduction to vernacular architecture in the global context – concepts and approaches in the study of vernacular architecture.	
UNIT – II	**VERNACULAR ARCHITECTURE IN THE INDIAN CONTEXT**	**8**
	The different vernacular architectural styles in India with examples. Northern region – Kashmir Architecture, Eastern region – Bengal Architecture, Western Region – Gujarat and kutch architecture, Rajasthan Havelis, Southern Region – Kerala and Chettinadu Architecture.	
UNIT – III	**CONCEPTS AND PRINCIPLES IN VERNACULAR STYLE**	**12**
	Study and understand the concepts and principles of Indian vernacular styles in terms of climate response, materials and indigenous construction techniques followed.	
UNIT – IV	**CASE STUDY OF AN IDENTIFIED SETTLEMENT**	**15**
	Detailed study of a traditional settlement and analysis in terms of the above-discussed concepts and principles.	
UNIT – V	**SUITABILITY IN PRESENT CONTEXT**	**5**
	Discussion on the Suitability of the vernacular concepts in the present context with examples.	

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	0	0	45

REFERENCES

1. Paul Oliver, Encyclopedia of Vernacular Architecture of the World, Cambridge University Press, 1997.

2. Amos Rappoport, House, Form & Culture, Prentice Hall Inc. 1969.

3. V.S.Praman, Haveli - Wooden Houses & Mansions of Gujarat, Mapin Publishing Pvt. Ltd., Ahmedabad, 1989.

4. Kullrishan Jain & Minakshi Jain - Mud Architecture of the Indian Desert, Aadi Centre, Ahmedabad, 1992.

5. G.H.R. Tillotsum - The tradition of Indian Architecture Continuity, Controversy - Change since 1850, Oxford University Press, Delhi, 1989.

6. Carmen Kagal, VISTARA - The Architecture of India, Pub: The Festival of India, 1986.

YAR 301 – SUSTAINABLE URBAN LANDSCAPE **3 – 0 – 0 – 3**

SUBCODE	SUB NAME	L	T	P	C
YAR301	SUSTAINABLE URBAN LANDSCAPE	3	0	0	3
C:P:A =	1.5:0.75:0.75	L	T	P	H
		3	0	0	3
UNIT – I	**ECOLOGY AND LANDSCAPE**				**6**
	Concept of Ecosystem: General Structure and Function (Ecological Terms) - Energy flow, Primary & Secondary Production – Types of Biogeochemical cycles; Carbon cycle – carbon emission, Global water cycles, nitrogen cycle bioaccumulation and biomagnifications and – Analysis and evaluation. Concept of ecosystem services.- Types of Ecosystems Environmental Impact Assessment (EIA) and the Environmental Impact Statement: Theory and Practice. Illustrative examples from India to demonstrate the degree of effectiveness. The role of Environmental Legislation and the Ministry of Environment and Forests Evolution of landscape planning based on the ecosystem – concepts and projects of McHarg, Carl Steinitz, Warren Manning, August Hills, Phil Lewis – Izank Zonneveld, Ervin Zube - landscape planning models.				
UNIT – II	**PLANTS AND DESIGN**				**10**
	Planting as a design element for structuring the landscape. Structural and visual characteristics of plants. Principles of visual composition. Plant association. Sustainable design –The role of plant material in environmental improvement, (e.g. soil conservation, modification of microclimate). Sustainable landscape maintenance and management, Sustainable planning and city form. Sustainable urban landscape, landscape sustainability at the national and regional level(LEEDS, BREAM) Ecological and Botanical considerations in landscape design. Plant data sheet. Planting for wildlife, land rehabilitation, the role of planting in water shed management. Design concepts and its construction methods of a terrace garden, vertical garden/sky garden. Urban forestry development and management in the present scenario.				
UNIT – III	**CULTURAL AND HISTORIC LANDSCAPE**				**10**
	Early traditions and beliefs about landscape and environment in the east. Ancient Indian traditions – Vedic, Jainism, Buddhism and later Hindu movements. Symbolic meanings and sacred value of natural landscapes. Transfer of concepts through Buddhism to China –Chinese landscape development – gardens of China – Pre Buddhist Japanese landscapes – the impact of China on Japanese gardens – Japanese gardens. The nomadic culture of				

	Central Asia – the advent of Islam – the concept of Paradise as a garden – spread of Islamic traditions to the West and East. Eastern expression of Islam – Samarkhand and Mughal India – Tomb and pleasure garden – Mughal concepts of site planning. Western expression of Islam – Spain Alhambra and General life, Granada.	
UNIT – IV	**CONTEMPORARY LANDSCAPE**	**10**
	Development of the enclosed garden in the Middle ages. Renaissance – Italy, France and England, Romanticism. Industrialization and urbanization – impacts and development of the concept of public open spaces, open space development in new towns, parks movement. Open space development and its urban design and planning context, Early industrial towns and the garden city movement. Open space development and Close conceptual relationship between Town planning, urban design and landscape architecture. Study of selected works of modern landscape architects. Frederick Law Olmsted, *Martha Schwartz,* Burle Marx, *Ravindra Bhan* and other pioneers.	
UNIT – V	**CASE STUDY**	**9**
	Analysis and understanding of philosophies of Contemporary landscape architect work in India and abroad.eco-tourism projects, landscape in civic spaces, landscape projects at the urban level.	

	LECTURE	**TUTORIAL**	**PRACTICAL**	**TOTAL**
	45	**0**	**0**	**45**

TEXT

1. Nick Robinson, The Planting Design Hand book, Gower Pub., 1998

REFERENCES

1. Geoffrey and Susan Jellico, The landscape of Man, Thames & Hudson Publication, 1995
2. Robert Holden, New landscape Design, Lawrence king publishing, UK, 2003
3. Penelope Hill, Contemporary history of garden design, Birkhauser publishers, 2004
4. Elizabeth Barlow Rogers, Landscape Design – A Cultural &Architectural History, Hary & Abram inc. publishers, 2001.
5. Phillip Pregill & Nancy Volkman, Landscapes in History, Van Nostrand publishers, 1993.
6. Jonas Lehrman, Earthly Paradise- Garden and courtyard in Islam, Thames and Hudson,1980.
7. G.B.Tobey, A history of American Landscape architecture, American Elsevier Publishing Co., NY, 1973.

YAR302 HERITAGE CONSERVATION PLANNING		3 – 0 – 0 – 3			

SUBCODE	SUB NAME	L	T	P	C
YAR 302	HERITAGE CONSERVATION PLANNING	3	0	0	3
C:P:A	1.5:0.75:0.75	L	T	P	H
		3	0	0	3

UNIT – I INTRODUCTION TO CONSERVATION 6

Understanding Heritage-Types of Heritage- Heritage conservation: Need, Debate and purpose- Defining Conservation, Preservation and Adaptive reuse- Distinction between Architectural and Urban Conservation- International agencies like ICCROM, UNESCO AND their role in Conservation.

UNIT–II PROCEDURE FOR CONSERVATION 10

Procedure for the listing of structures for conservation. Inventories, inspection, documentation; degree of intervention for prevention of deterioration, prevention of existing state, consolidation of the fabric, restoration, rehabilitation, reproduction, reconstruction, etc. – To study the structural elements of buildings such as beams, arches and domes; walls, piers and columns, foundation, etc. - Causes of decay in buildings by natural and human factors, The role of conservation Architect and his team.

UNIT–III STRUCTURAL CONSERVATION 6

Listing of monuments – documentation of historic structures – assessing architectural character – historic report – guidelines for preservation, rehabilitation and adaptive re-use of historic structures – seismic retrofit and disabled access /services additions to historic buildings – heritage site management.

UNIT–IV LEGISLATION AND INSTITUTIONS 10

. Special legislation – central and state. New Concepts and emerging trends in Conservation. Methods and procedures adopted by agencies such as UNDP, UNESCO, ICOMOS, ICCROM, ASI, INTACH

UNIT–V CASE – STUDIES 9

Case studies of Conservation projects in Indian and International context. Appraisal of a conservation project in view of the above issues - Success and failure – reasons for it.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	0	0	45

REFERENCES

1. Conservation and Development in Historic Towns and Cities. - Pamela Ward - Orid Press. Ltd.
2. Planning for Conservation - Kain Roger, - St.Martin N-Y 1981
3. Recycling Cities – Cutler and Cutter – Canni, Massachusetts, 1976.
4. Character of Towns an Approach to Conservation - Worsket Roy, Architectural Press – London.
5. Guidelines for Conservation by INTACH
6. Conservation of Historic buildings, Sir Bernard M Feilden, - Architectural Press, 1982.
7. Gerald Glenn, “Presentation & Rehabilitation”, (1996), ASTM International.
8. A History of Architectural Conservation, (1’st Pub.1999, Reprint 2005) –Elsevier Butterworth, Oxford, UK.

YAR303 – URBAN DESIGN PRACTICES 3 – 0 – 0 – 3

SUBCODE	SUB NAME	L	T	P	C
YAR303	URBAN DESIGN PRACTICES	3	0	0	3
C:P:A	3:0:0	L	T	P	H
		3	0	0	3
UNIT – I	**INTRODUCTION TO URBAN DESIGN THEORY**				**10**
	Urban design heritage of the western world and India. The roots of our modern urban design and planning concepts.				
UNIT – II	**ELEMENTS OF URBAN DESIGN**				**9**
	Urban form determined by the inter-play of masses, voids, building typology, scale. Form of squares, streets, vistas & focal points, the image of the city & its components. To make the city comprehensible, humane and to give proper scale. To treat urban spaces & masses and apply the latest techniques.				
UNIT – III	**URBAN DESIGN METHODOLOGIES**				**9**
	To understand the activities of the city center, its traffic pattern along with activity pattern and its organization tackling grey areas in the city, tackling the traffic & parking and creating activity hubs. Methods of urban design surveys, documentation and representation. Cognitive mapping – contemporary and traditional, architectural expressions.				
UNIT – IV	**URBAN RENEWAL & DEVELOPMENT**				**8**
	Historic overview of urban renewal, Development strategies for regeneration of inner-city areas, recycling, renewal, etc. Case studies of urban renewal. Adaptive reuse and Brown Field projects in India and abroad. Infrastructure up-gradation, economic regeneration, financing and management of urban renewal schemes. Institutional framework for urban conservation and renewal strategies in India				
UNIT – V	**CASE STUDIES**				**9**
	Implementation of urban design schemes. Development control regulations and their application. Legal & administrative aspects, policies, charters, case studies of proposals for urban design projects from India & Abroad.				

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	0	0	45

REFERENCES

1. Jon Lang, "Urban design" – a typology pf procedures & products 2005, Glsevier, North America.8
2. Geoffrey Broadbent, "Emerging concepts in Urban Space Design-(1995), Jayker & ravels.
3. Cliff Monghtin, "UD-Street & Square," (2003), Architectural Press.
4. Jonathan Barnett, "Designing cities without designing building", (1982), Harper & Row, New York.
5. Edmond Bacon, "Design of cities", (1976), revised edition, Viking Penguin Inc; U.S.A.
6. Paul D. Spreiregan AIA, Urban design: the architecture of town and cities, Mc Graw-Hill Book Company, New York.

SUBCODE	SUB NAME	L	S	P	C
YAR 304B	ENERGY SIMULATION AND MODELLING	2-0-2-3			

SUBCODE	SUB NAME	L	S	P	C
YAR304B	ENERGY SIMULATION AND MODELLING	2	0	2	3
C:P:A	1.2:0:1.8	L	T	P	H
		2	0	2	4
UNIT – I	INTRODUCTION TO ENERGY				10
	Definition and units of energy, power, Forms of energy, Conservation of energy, second law of thermodynamics, Energy flow diagram to the earth. Origin of fossil fuels, the time scale of fossil fuels, Renewable Energy Resources, Role of energy in economic development and social transformation.				
UNIT – II	INTRODUCTION TO SOLAR ENERGY				10
	Solar Spectrum, Solar Time and angles, day length, angle of incidence on the tilted surface; Sun path diagram; Shadow angle protractor; Solar Radiation: Extraterrestrial Radiation; Effect of earth atmosphere; Estimation of solar radiation on horizontal and tilted surfaces; Measurement of Solar radiation, Analysis of Indian solar radiation data and applications.				
UNIT – III	INTRODUCTION TO ENERGY MODELLING				10
	Definition of energy modeling, Answers that energy modeling provides, Building modeling tools: Daylighting/ lighting modeling, Computational fluid dynamics(CFD), Building component analysis, HVAC analysis, Building thermal analysis, Whole building energy simulation programs.				
UNIT – IV	INTERFACES AND SOFTWARE PACKAGES				15
	Introduction to interfaces of energy modeling software packages, DOE2, ENERGY PLUS, ECOTECT, CLIMATE CONSULTANT, HEED, BERS, GREEN BUILDING STUDIO.				
UNIT – V	CASE STUDY				15
	Literature case study and live case study, Energy modeling of a residential building.				

LECTURE	TUTORIAL	PRACTICAL	TOTAL
30	0	30	60

REFERENCES

1. Eddy Krygiel., Bradley Nies, Green BIM Wily publishing, Canada, 2008.
2. Advanced Energy Design Guide For Small Office Buildings, American Society of Heating Refrigerating and Airconditioning, USA 2004.
3. Davies, Morris Grenfell, Building Heat Transfer, Wiley, 2008.
4. Underwood, Chris, Modelling Methods For Energy In Buildings, Wiley-Blackwell, 2008.
5. International Energy Conservation Code 2003, International Code Council.
6. Baker, Nick, Energy And Environment In Architecture, Taylor & Francis, 2000.
7. Dobbelsteen, Andy van den, Smart Building In A Changing Climate, Island Press, 2009.

YAR ON06	**RETHINK THE CITY: NEW APPROACHES TO GLOBAL AND LOCAL URBAN CHALLENGES**	**2**	**0**	**0**	**4**
		L	**T**	**P**	**H**
		2	**0**	**0**	**2**
WEEK – I	**WELCOME AND OPENING**				**5**
	This week is devoted to introducing the course and getting to know each other. This week also contains the first assignment of the course which aims to introduce yourself and the urban challenge in your own context				
WEEK – II-IV	**PARALLEL MODULES**				**15**
	During these you can choose in which order to take the modules, but there is a fixed sequence of activities inside each module, consisting of lecture videos, quizzes and assignments. In order to keep an appropriate workload, the course team suggests to take one module per week. Module - Spatial Justice This module will analyze concrete cases of spatial justice and injustice in emerging economies and discuss how contemporary theories apply in the booming metropolises of the Global South. Module - Housing Provision and Management This module will discuss the role of the State, the society and the private sector in housing policies, exploring opportunities for hybrid and alternative housing provision models in different contexts. Module – Sustainable Urban Transitions This module will introduce the topic of sustainable urban transitions and will discuss the complexity of these multi-level processes by highlighting the potential of innovation on the small scale and the challenges of institutionalizing these innovations.				
WEEK –V-IV	**FINAL ASSIGNMENT AND PEER REVIEW**				**10**
	The final assignment is meant for you to develop a critical stance towards the urban challenges in your own context, using the theories and tools presented during the course. You will have one full week to prepare your final assignment. Hot Topics: in these weeks you will also have access to additional videos that discuss hot topics in both the Global South and the urban development discourse. This will complement the content of the modules. These videos are completely optional and they won't have quizzes or any required practical assignment.				

LECTURE	**TUTORIAL**	**PRACTICAL**	**TOTAL**
30	**0**	**0**	**30**

REFERENCES

1. Rethink The City: New Approaches To Global And Local Urban Challenges **- Tu Delft**

COURSE CODE	XUM106	L	T	P	C
COURSE NAME	CONSTITUTION OF INDIA	0	0	0	0
PREREQUISITE:	NIL	L	T	P	H
C:P:A	3:0:0	0	0	0	3

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Understand*** the Constitutional History	Cognitive	Understanding
CO2	***Understand*** the Powers and Functions	Cognitive	Understanding
CO3	***Understand*** the Legislature	Affective	Remembering
CO4	***Understand*** the Judiciary	Affective	Remembering
CO5	***Understand*** the Centre State relations	Cognitive	Understanding

UNIT I	08
Constitutional History- The Constitutional Rights- Preamble- Fundamental Rights- Fundamental Duties- Directive principles of State Policy.	
UNIT II	**09**
The Union Executive- The President of India (powers and functions)- Vice-President of India-The Council of Ministers-Prime Minister- Powers and Functions.	
UNIT III	**10**
Union Legislature- Structure and Functions of Lok Sabha- Structure and Functions of Rajya Sabha- Legislative Procedure in India- Important Committes of Lok Sabha- Speaker of the Lok Sabha.	
UNIT IV	**09**
The Union Judiciary- Powers of the Supreme Court- Original Jurisdiction- Appelete jurisdictions- Advisory Jurisdiction- Judicial review.	
UNIT V	**09**
Centre State relations- Political Parties- Role of governor, powers and functions of Chief Minister- Legislative Assembly- State Judiciary- Powers and Functions of the High Courts.	

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	0	0	45

REFERENCES

1.	W.H.Morris Shores- Government and politics of India, NewDelhi,B.1.Publishers,1974.
2.	M.V.Pylee- Constitutional Government in India, Bombay, Asia Publishing House, 1977.
3.	R.Thanker- The Government and politics of India, London:Macmillon, 1995.
4.	A.C.Kapur- Select Constitutions S,Chand & Co.,NewDelhi, 1995
5.	V.D.Mahajan- Select Modern Governments,S,Chand &Co, NewDelhi,1995.

6.	B.C.Rout- Democractic Constitution of India.
7.	Gopal K.Puri- Constitution of India, India 2005.

XUM106- Mapping of COs with POs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	2			1					
CO 2	2			1					
CO 3	2			1					1
CO 4	2			1				1	1
CO 5	2	2		1				1	1
Total	10	2		5				2	3
Scaled to 0,1,2,3	2	1		1				1	1

1-5 →1, 6-10 →2, 11-15 →3

0 – No Relation, 1- Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE	XUM403	L	T	P	C
COURSE NAME	HUMAN ETHICS, VALUES, RIGHTS AND GENDER EQUALITY	1	0	0	1
PREREQUISITES	NIL	L	T	P	H
C:P:A= 1:0:0		1	0	0	1

COURSE OBJECTIVES

- Students will ultimately be assessed on their ability to demonstrate a commitment to professionalism, rights, ethical behavior, service, and, as appropriate, leadership.
- Students will ultimately be assessed on their knowledge of the legal system and legal doctrine. Students will graduate with a broad knowledge of foundational and other core areas human rights, specialized knowledge in areas of interest, and experience with advanced study.
- Students will ultimately be assessed on the development of legal analysis, legal communication, and legal research.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Relate*** and ***Interpret*** the human ethics and human relationships	Cognitive	Remember, Understanding
CO2	***Explain*** and ***Apply*** gender issues, equality and violence against women	Cognitive	Understanding, Applying
CO3	***Classify*** and ***Develop*** the identify of women issues and challenges	Cognitive Affective	Analyzing Receiving
CO4	***Classify*** and ***Dissect*** human rights and report on violations.	Cognitive	Understanding, Analyze
CO5	***List*** and ***respond*** to family values, universal brotherhood, fight against corruption by common man and good governance.	Cognitive Affective	Remember, Respond

UNIT I	HUMAN ETHICS AND VALUES	7

Human Ethics and values - Understanding of oneself and others- motives and needs- Social service, Social Justice, Dignity and worth, Harmony in human relationship: Family and Society, Integrity and Competence, Caring and Sharing, Honesty and Courage, WHO's holistic development - Valuing Time, Co-operation, Commitment, Sympathy and Empathy, Self respect, Self-Confidence, character building and Personality.

UNIT II	GENDER EQUALITY	9

Gender Equality - Gender Vs Sex, Concepts, definition, Gender equity, equality, and empowerment. Status of Women in India Social, Economical, Education, Health, Employment, HDI, GDI, GEM. Contributions of Dr.B.R. Ambethkar, Thanthai Periyar and Phule to Women Empowerment.

UNIT III	WOMEN ISSUES AND CHALLENGES	9

Women Issues and Challenges- Female Infanticide, Female feticide, Violence against women, Domestic violence, Sexual Harassment, Trafficking, Access to education, Marriage. Remedial Measures – Acts related to women: Political Right, Property Rights, and Rights to Education, Medical Termination of Pregnancy Act, and Dowry Prohibition Act.

UNIT IV	HUMAN RIGHTS	9

Human Rights Movement in India – The preamble to the Constitution of India, Human Rights and Duties, Universal Declaration of Human Rights (UDHR), Civil, Political, Economical, Social and Cultural Rights, Rights against torture, Discrimination and forced Labour, Rights and protection of children and elderly. National Human Rights Commission and other statutory Commissions, Creation of Human Rights Literacy and Awareness. - Intellectual Property Rights (IPR). National Policy on occupational safety, occupational health and working environment.

UNIT V	GOOD GOVERNANCE AND ADDRESSING SOCIAL ISSUES	9

Good Governance - Democracy, People's Participation, Transparency in governance and audit, Corruption, Impact of corruption on society, whom to make corruption complaints, fight against corruption and related issues, Fairness in criminal justice administration, Government system of Redressal. Creation of People friendly environment and universal brotherhood.

REFERENCES

1. Aftab A, (Ed.), Human Rights in India: Issues and Challenges, (New Delhi: Raj Publications, 2012).
2. Bajwa, G.S. and Bajwa, D.K. Human Rights in India: Implementation and Violations (New Delhi: D.K. Publications, 1996).
3. Chatrath, K. J. S., (ed.), Education for Human Rights and Democracy (Shimala: Indian Institute of Advanced Studies, 1998).
4. Jagadeesan. P. Marriage and Social legislations in Tamil Nadu, Chennai: Elachiapen Publications, 1990).
5. Kaushal, Rachna, Women and Human Rights in India (New Delhi: Kaveri Books, 2000)
6. Mani. V. S., Human Rights in India: An Overview (New Delhi: Institute for the World Congress on Human Rights, 1998).
7. Singh, B. P. Sehgal, (ed) Human Rights in India: Problems and Perspectives (New Delhi: Deep and Deep, 1999).
8. Veeramani, K. (ed) Periyar on Women Right, (Chennai: Emerald Publishers, 1996)
9. Veeramani, K. (ed) Periyar Feminism, (Periyar Maniammai University, Vallam, Thanjavur: 2010).
10. Planning Commission report on Occupational Health and Safety http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_occup_safety.p Central Vigilance Commission (Gov. of India) website: http://cvc.nic.in/welcome.html.
11. Weblink of Transparency International: https://www.transparency.org/
12. Weblink Status report: https://www.hrw.org/world-report/2015/country-chapters/india

LECTURE: 15	TUTORIAL: 0	SELF STUDY: 30	TOTAL HOURS:45

XUM403- Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1							
PO_2					2	2	1
PO_3							
PO_4							
PO_5							
PO_6							
PO_7							
PO_8	2	3	2	3	3	13	3
PO_9		1			2	3	1
PO_{10}				2	2	4	1
PO_{11}							
PO_{12}					2	2	1
PSO_1							
PSO_2							

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

XUM507			ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C
				1	0	1	0
C	P	A		L	T	C	P
1	0.5	0.5		1	0	1	2

PREREQUISITE:

COURSE OUTCOMES:

Course Outcomes	Domain	Level
After the completion of the course, students will be able to		
CO 1; Relate and **Interpret** the Indian Traditional Knowledge Systems	Cognitive	Remember, Understanding
CO 2; Explain and **Apply** Yogic-science and wisdom capsules	Cognitive	Understanding, Applying
CO 3; Classify and **Develop** of Yoga and holistic health care system	Cognitive Affective	Analyzing Receiving
CO 4; Classify and Dissect human rights and report on	Cognitive	Understanding, Analyze
CO 5; List and respond to family values, universal brotherhood,	Cognitive Affective	Remember, (Respond)

UNIT-I	**RELATE AND INTERPRET THE INDIAN TRADITIONAL KNOWLEDGE SYSTEMS**	**6 + 3 hrs**
Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.		
UNIT –II	**EXPLAINAND APPLY YOGIC-SCIENCE AND WISDOM CAPSULES**	**6 + 3 hrs**
Holistic life style of Yogic-science and wisdom capsules in Indian literature is also important in modern society with rapid technological advancements and societal disruptions.		
UNIT-III	**CLASSIFY AND DEVELOP OF YOGA AND HOLISTIC HEALTH CARE SYSTEM**	**6 + 3 hrs**
Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health.		
UNIT-IV	**CLASSIFY AND DISSECT HUMAN RIGHTS AND REPORT ON**	**6 + 3 hrs**
Connect up and explain basics of Indian Traditional knowledge modern scientific perspective		
UNIT-V	**LIST AND RESPOND TO FAMILY VALUES, UNIVERSAL BROTHERHOOD**	**6 + 3 hrs**
Modern Science and Indian Knowledge System • Yoga and Holistic Health care • Case Studies.		

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45		15	60

TEXT BOOKS:

a. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.

b. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
c. Fritzof Capra, Tao of Physics
d. Fritzof Capra, The wave of Life
e. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, InernationalChinmay Foundation, Velliarnad, Amaku,am
1. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta

REFERENCES:

1. GN Jha(Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, VidyanidhiPrakasham, Delhi, 2016
1. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, VidyanidhiPrakasham, Delhi, 2016 9. P R Sharma (English translation), ShodashangHridayam

EREFERENCES: https://nptel.ac.in/courses/109106059/14

Mapping of COs with Pos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2									2	2		2
CO 2	3	3	2	2	1		2				2	2	3	2
CO 3	3	3	2	2	1		2				2	2	3	2
CO 4	3	3	2	3	1	1	2				2	2	2	2
CO 5	3	3	3	3	1	1	2	1	1		2	3	3	3
	15	**14**	**9**	**10**	**4**	**2**	**8**	**1**	**1**		**10**	**11**	**11**	**11**

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XUME 706**	**L**	**T**	**P**	**C**
COURSE NAME	**CYBER SECURITY**	**0**	**0**	**0**	**0**

C: P: A = 3:0:0		L	T	P	H
		3	0	0	3

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	Able to ***understand*** the Cyber Security Policy, Laws and Regulations	Cognitive	Remember
CO2	Able to ***discuss*** the Cyber Security Management Concepts	Cognitive	Understand
CO3	Able to ***understand*** *t*he Cyber Crime and Cyber welfare	Cognitive	Understand
CO4	Able to ***discuss*** on issues related to Information Security Concepts	Cognitive	Understand
CO5	Able to ***understand***various security threats	Cognitive	Understand

UNIT I INTRODUCTION	**9**
Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration - Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E commerce – Counter Measures – Challenges	
UNIT IICYBER SECURITY OBJECTIVES AND GUIDANCE	**9**
Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – E Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Project– Cyber Security Management – Arriving at Goals – Cyber Security Documentation – The Catalog Approach – Catalog Format – Cyber Security Policy Taxonomy.	
UNIT IIICYBER SECURITY POLICY CATALOG	**9**
Cyber Governance Issues – Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging - Cyber User Issues - Malvertising - Impersonation – Appropriate Use – Cyber Crime – Geo location – Privacy - Cyber Conflict Issues – Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare	
UNIT IVINFORMATION SECURITY CONCEPTS	**9**
Information Security Overview: Background and Current Scenario - Types of Attacks - Goals for Security - E-commerce Security - Computer Forensics – Steganography	
UNIT VSECURITY THREATS AND VULNERABILITIES	**9**
Overview of Security threats -Weak / Strong Passwords and Password Cracking - Insecure Network connections - Malicious Code - Programming Bugs - Cyber crime and Cyber terrorism - Information Warfare and Surveillance	

	LECTURE	TUTORIAL	TOTAL
	45	0	45

REFERENCE BOOKS

1.Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss "Cyber Security Policy Guidebook" John Wiley & Sons 2012.

2. Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.

3. Richard A. Clarke, Robert Knake "Cyberwar: The Next Threat to National Security & What to Do About It" Ecco 2010

4. Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011

5. Rhodes-Ousley, Mark, "Information Security: The Complete Reference", Second Edition, McGraw-Hill, 2013.

E RESOURCES

1. **https://www.coursera.org/specializations/cyber-security**
2. **www. nptel**.ac.in
3. **http://professional.mit.edu/programs/short-programs/applied-cybersecurity**

Subject Code			XUM 307	L	T	P	C
Subject Name			UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY	2	1	0	3
C	P	A		L	T	P	H
3	0	0		2	1	0	3
Prerequisite			None. Universal Human Values 1 (desirable)				

Course Objective: 1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence

3. Strengthening of self-reflection.

4. Development of commitment and courage to act.

Course Outcome:		Domain	Level
CO1	***Present*** sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them	Cognitive	Understand
CO2	**Grasp** the right utilization of their knowledge in their streams of Technology/Engineering/Management/any other area of study to ensure mutual fulfilment. Ex. mutually enriching production system with rest of nature.	Cognitive	Understand
CO3	***Outline*** the importance of generation of new ideas for entrepreneurship and ***illustrate*** market assessment.	Cognitive	Understand

UNIT - I :	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**	6+3

Purpose and motivation for the course, recapitulation from Universal Human Values I - Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration - Continuous Happiness and Prosperity - A look at basic Human Aspirations - Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority - Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario - Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT - II :	**Understanding Harmony in the Human Being - Harmony in Myself**	6+3

Understanding human being as a co-existence of the sentient 'I' and the material 'Body' - Understanding the needs of Self ('I') and 'Body' - happiness and physical facility - Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the

characteristics and activities of 'I' and harmony in 'I' - Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail - Programs to ensure Sanyam and Health. Practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease		
UNIT - III :	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**	**5+3**
Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship - Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship - Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals - Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives		
UNIT - IV :	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**	**4+2**
Understanding the harmony in the Nature 1 - Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature - Understanding Existence as Co-existence of mutually interacting units in all-pervasive space - Holistic perception of harmony at all levels of existence. Practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.		
UNIT - V :	**Implications of the above Holistic Understanding of Harmony on Professional Ethics**	**7+3**
Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of peoplefriendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations - Sum		

up. Practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

LECTURE	TUTORIAL	TOTAL
28	**14**	**42+3(SS)**

TEXT BOOKS:

Human Values and Professional Ethics - R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

REFERENCE BOOKS :

1. Jeevan Vidya Ek - Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values - A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Leonard, Annie. 2011. The Story of Stuff. New York, NY: Simon & Schuster.
4. The Story of My Experiments with Truth - Mohandas Karamchand Gandhi
5. AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology)
6. Small is Beautiful - E. F Schumacher.
7. Slow is Beautiful - Cecile Andrews.
8. Economy of Permanence - J C Kumarappa.
9. Bharat Mein Angreji Raj – PanditSunderlal.
10. Rediscovering India - by Dharampal.
11. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi.
12. India Wins Freedom - Maulana Abdul Kalam Azad
13. Vivekananda - Romain Rolland (English)
14. Gandhi - Romain Rolland (English)

XBT OE 1			INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
				3	0	0	3
C	P	A		L	T	P	H
0	0	0		3	0	0	3

Learning Objectives:

Upon completion of this course, the students

- Would have understand the various types of IPR.
- Would have learn to search the database, drafting the patent and filing process.
- Would have understand about the IPR related disputes.

Course Outcomes		Domain	Level
CO1	***Understand*** the significance of IPR and ***identify*** various types of IPR.	Cognitive	Receiving Understanding
CO2	***Understand*** the process of *registration and* ***infer*** *the valuation of IP*.	Cognitive	Understanding Analysing
CO3	***Understand*** the legal framework and ***infer*** legislative process in India.	Cognitive	Receiving Analysing
CO4	***Understand*** the international commitment and ***imply*** suitable market for the registered IP.	Cognitive	Understanding
CO5	***Explain*** the specification and ***infer*** values for IP.	Cognitive	Understanding

I - Introduction to IPR	**9**
Creativity, Invention, Innovations; Importance of Intellectual Property; Types of Intellectual Property; History and development of IPR in India – Initiatives by Indian Government towards IPR – advancement in S&T, traditional knowledge and biodiversity resources.	
II- Types, Registration and Valuation of IPR (India/Pct)	**9**
Patents – Copyrights and related rights – Trade Marks – Industrial Designs – Protection of Integrated Circuits and Layout Design – Geographical Indications of Goods – Biological Diversity – Plant Varieties and Farmers Rights – Trade Secrets / undisclosed information.	
III- Legal and Legislation Framework in India	**9**
IPR Laws – Owner's Rights – Negotiation of International Treaties – Traditional Knowledge Digital Library (TKDL) – Commercialization of IPR – Enforcement and Adjudication – Human Capital Development.	
IV- International Conventions and Treaties	**9**
WTO - International conventions – Establishment of WIPO – General Agreement on Trade and Tariff (GATT) – TRIPS – PCT.	
V - IPR Management	**9**
Drafting patent specification – Claims- IPR audit-IP asset management – IP Litigations – Transfer of Rights – IP training and education – IP valuation – Agreement Drafting.	

Lecture	Tutorial	Practical	Total
45	**0**	**0**	**45**

Text Books

1. Subbaram N.R."Handbook of Indian Patent Law and Practice ", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.

E-References

1 Neeraj Pandey, Khushdeep Dharni, Intellectual Property Rights, PHI Private Limited, Delhi, 2014.

2 Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].

3 Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707_gibbs.html.

E Resources

1. http://www.wipo.int/patentscope/en/
2. http://www.ipindia.nic.in/
3. http://www.uspto.gov/
4. https://www.epo.org/index.html
5. https://www.jpo.go.jp/

XBTOE 2			INDUSTRIAL SAFETY AND RISK MANAGEMENT	L	T	P	C
				3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3

Prerequisites : Nil

Learning Objectives:

Upon completion of this course, the students

- Would have learn the importance of safety and risk management in industry.
- Would have learn to make strategies to avoid the industrial accidents.

Course Outcomes: At the end of this course, the students should be able to		**Domain**	**Level**
CO1	**State** the basic classification of safety measures and **explain** the fundamentals of Industrial Safety.	Cognitive	Remembering Understanding
CO2	**Interpret** a **analyze** the Hazard and Audit System	Cognitive	Remembering Understanding
CO3	**Know** the Risk Management and **estimate** the First Aid types and properties.	Cognitive	Remembering Understanding
CO4	**Analyze** and **evaluate** Safety Procedures	Cognitive	Remembering Understanding
CO5	**Knows** the safety handling and will **analyze** the related Chemicals Safety and Storages.	Cognitive	Remembering Understanding

I - Industrial Safety	**9 hrs**
Concepts of safety – Hazard classification chemical, physical, mechanical, ergonomics, biological and noise hazards – Hazards from utilities like air, water, steam.	
II - Hazard Analysis	**9 hrs**
Hazard identification and control – HAZOP, job safety analysis – Fault tree analysis – Event tree analysis – Failure modes and effect analysis and relative ranking techniques – Safety audit – Safety Survey – Plant inspection – Past accident analysis.	
III- Risk Management	**9 hrs**
Overall risk analysis – Chapains model, Eand FI model– Generation of meteorological data – Ignition data – Population data – Overall risk contours for different failure scenarios – Disastar management plan – Emergency planning – Onsiteand offsite emergency planning – Risk management – Gas processing complex, refinery – First Aids.	
IV- Safety Procedures	**9 hrs**
Safety in plant design and layout – Safety acts and regulations for industries.	
V - Safety in Handling and Storage of Chemicals	**9 hrs**

Safety measures in handling and storage of chemicals – Fire chemistry and its control – Personal protection.			
Lecture	**Tutorial**	**Practicals**	**Total**
45	**0**	**0**	**45**

Text Books

1. Deshmukh, L.M., "Industrial Safety Management (Hazard identification and risk control)", TATA McGraw Hill, 2008.
2. Raghavan, K.V. and Khan, A.A., "Methodologies in Hazard Identification and Risk
3. Blake, R.P., "Industrial Safety", Prentice Hall, 1953.

References

1. A Guide to Hazard Operability Studies", Chemical Industry Safety Council, 1977.
2. Geoff Wells,"Hazard Identification and risk assessment", IIChE, UK.
3. Lees, F.P., "Loss Prevention in Process Industries", 2nd Edition, Butterworth Heinemann, 1996.

COURSE CODE	XUM606	L	T	P	C
COURSE NAME	ECONOMICS FOR ENGINEERS	3	0	0	3
PREREQUISITES		L	T	P	H
C:P:A	2.64:0.24:0.12	3	0	0	3

Learning Objectives

- To provide comprehensive coverage of economical concepts for precise decision makings in engineering domains.
- To develop the ability of engineers to analysis the cost and revenue by using economical tools.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Explain*** the concepts of economics in engineering and ***identify*** element of cost to prepare cost sheet	Cognitive Psychomotor	Understand Perception
CO2	***Calculate and Explain*** the Break-even point and marginal costing	Cognitive Psychomotor	Understand &Apply Perception
CO3	***Summarize*** and ***Use*** value engineering procedure for cost analysis	Cognitive Affective	Understand Receive
CO4	***Estimate*** replacement problem	Cognitive	Understand
CO5	***Compute, Explain*** and ***make Use of*** different methods of depreciation	Cognitive	Understand &Apply

UNIT I: INTRODUCTION TO ECONOMICS **08**

Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- types of costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost

UNIT II: BREAK-EVEN ANALYSIS&SOCIAL COST BENEFIT ANALYSIS **12**

Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations

Social Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.

UNIT III:DEPRECIATION **10**

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation.

UNIT IV: REPLACEMENT AND MAINTENANCE ANALYSIS **07**

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery

with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.			
UNIT V:INFLATION AND PRICE CHANGE			**08**
Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes in Engineering Economic Analysis, Cash Flows that inflate atdifferent Rates.			
	LECTURE	**TUTORIAL**	**TOTAL**
HOURS	**45**	**0**	**45**

TEXT BOOKS

1. G. Rajendra et.al., "Engineering Economy 1st Edition", New Age International,2006
2. S.P.Jain& Narang, "Cost accounting – Principles and Practice", Kalyani Publishers, Calcutta, 2012.

REFERENCES

1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,DavidB.Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson

Table 1 : Mapping of CO's with POs

	PO_1	**PO_2**	**PO_3**	**PO_4**	**PO_5**	**PO_6**	**PO_7**	**PO_8**	**PO_9**	**PO_{10}**	**PO_{11}**	**PO_{12}**
CO1	**1**	**2**	**0**	**1**	**0**	**0**	**1**	**1**	**1**	**2**	**2**	**3**
CO2	**2**	**2**	**1**	**2**	**0**	**0**	**2**	**1**	**1**	**2**	**3**	**3**
CO3	**2**	**2**	**1**	**3**	**0**	**0**	**2**	**2**	**1**	**2**	**2**	**3**
CO4	**1**	**2**	**1**	**2**	**0**	**0**	**0**	**1**	**1**	**1**	**2**	**3**
CO5	**1**	**2**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**1**	**2**	**3**
Scaled	**1**	**2**	**1**	**2**	**0**	**0**	**1**	**1**	**1**	**2**	**2**	**3**

0 – No relation 1- Low relation 2- Medium relation 3 – High relation

DISASTER MANAGEMENT

Course Outcomes:		Domain	Level
CO1	Understanding the concepts of application of types of disaster preparedness	Cognitive	Application
CO2	On completion of this course the students will be able to understand planning essentials of disaster.	Cognitive	Analyze
CO3	Have a good understanding of importance of seismic waves occurring globally	Cognitive	Analyze
CO4	On completion of this course, the students will be able to perform drill essential for disaster mitigation	Cognitive	Application
CO5	Have a keen knowledge on essentials of risk reduction	Cognitive	Application

COURSE CODE	COURSE NAME	L	T	P	C
XUM 606	**DISASTER MANAGEMENT**	**3**	**0**	**0**	**3**
C:P: A		**L**	**T**	**P**	**H**
3:0:0		**3**	**0**	**0**	**3**

UNIT- I: INTRODUCTION — **9**

Introduction – Disaster preparedness – Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management – Alternative to dominant approach– disaster-development linkages -Principle of risk partnership

UNIT- II: APPLICATION OF TECHNOLOGY IN DISASTER RISK REDUCTION — **9**

Application of various technologies: Data bases – RDBMS – Management Information systems – Decision support system and other systems – Geographic information systems – Intranets and extranets – video teleconferencing. Trigger mechanism – Remote sensing-an insight – contribution of remote sensing and GIS - Case study

UNIT- III: AWARENESS OF RISK REDUCTION — **9**

Trigger mechanism – constitution of trigger mechanism – risk reduction by education – disaster information network – risk reduction by public awareness

UNIT- IV: DEVELOPMENT PLANNING ON DISASTER — **9**

Implication of development planning – Financial arrangements – Areas of improvement – Disaster preparedness – Community based disaster management– Emergency response.

UNIT- V: SEISMICITY — **9**

Seismic waves – Earthquakes and faults – measures of an earthquake, magnitude and intensity – ground damage – Tsunamis and earthquakes

	LECTURE	TUTORIAL	TOTAL
	45	**0**	**45**

TEXTBOOKS

1. Siddhartha Gautam and K Leelakrishna Rao, “Disaster Management Programmes and Policies”, Vista International Pub House, 2012,
2. Arun Kumar, “Global Disaster Management”, SBS Publishers, 2008

REFERENCES

1. Encyclopaedia of Disaster Management, Neha Publishers & Distributors, 2008
2. Pradeep Sahni, Madhavi Malalgoda and Ariyabandu, “Disaster risk reduction in South Asia”, PHI, 2002
3. Amita Sinvhal, “Understanding earthquake disasters” TMH, 2010.
4. Pardeep Sahni, Alka Dhameja and Uma Medury, “Disaster mitigation: Experiences and reflections”, PHI, 2000

SUB CODE			XUM305	L	T	P	C
SUB NAME			ENTREPRENEURSHIP DEVELOPMENT	3	0	0	3
PREREQUISITE							
C	P	A		L	T	P	H
2.7	0	0.3		3	0	0	3

Course Outcome		Domain/Level C or P or A
CO1	***Recognise*** and ***describe*** the personal traits of an entrepreneur.	C (Understand) A(Receiving)
CO2	***Determine*** the new venture ideas and ***analyse*** the feasibility report.	C(Understand, Analyze)
CO3	***Develop*** the business plan and ***analyse*** the plan as an individual or in team.	C (Analyze) A (Receiving)
CO4	***Describe*** various parameters to be taken into consideration for launching and managing small business.	C (Understand)
CO5	***Explain*** the technological management and Intellectual Property Rights	C (Understand)

COURSE CONTENT

UNIT – I : ENTREPRENEURIAL TRAITS AND FUNCTIONS	**9**
Definition of Entrepreneurship; competencies and traits of an entrepreneur; factors affecting Entrepreneurship Development; Role of Family and Society ; Achievement Motivation; Entrepreneurship as a career and national development;	
UNIT – II : NEW PRODUCT DEVELOPMENT AND VENTURE CREATION	**9**
Ideation to Concept development; Sources and Criteria for Selection of Product; market assessment ; Feasibility Report ;Project Profile; processes involved in starting a new venture; legal formalities; Ownership; Case Study.	
UNIT – III : ENTREPRENEURIAL FINANCE	**9**
Financial forecasting for a new venture; Finance mobilization; Business plan preparation; Sources of Financing, Angel Investors and Venture Capital; Government support in startup promotion.	
UNIT – IV : LAUNCHING OF SMALL BUSINESS AND ITS MANGEMENT	**9**
Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching – Incubation, Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units.	
UNIT – V : TECHNOLOGY MANAGEMENT, IPR PORTFOLIO FOR NEW PRODUCT VENTURE	**9**
Technology management; Impact of technology on society and business; Role of Government in supporting Technology Development and IPR protection; Entrepreneurship Development Training and Other Support Services.	
L = 45 hrs T = 0 hrs P=0hrs Total = 45hrs	
TEXT BOOKS	

1. Hisrich, 2016, *Entrepreneurship*, Tata McGraw Hill, New Delhi.
2. S.S.Khanka, 2013, *Entrepreneurial Development*, S.Chand and Company Limited, New Delhi.

REFERENCES

1. Mathew Manimala, 2005, *Entrepreneurship Theory at the Crossroads, Paradigms & Praxis*, Biztrantra ,2nd Edition.
2. Prasanna Chandra, 2009, *Projects – Planning, Analysis, Selection, Implementation and Reviews*, Tata McGraw-Hill.
3. P.Saravanavel, 1997, *Entrepreneurial Development*, Ess Pee kay Publishing House, Chennai.
4. Arya Kumar,2012, *Entrepreneurship: Creating and Leading an Entrepreneurial Organisation*, Pearson Education India.
5. Donald F Kuratko, T.V Rao, 2012, *Entrepreneurship: A South Asian perspective*, Cengage Learning India.
6. Dinesh Awasthi, Raman Jaggi, V.Padmanand, Suggested Reading / Reference Material for Entrepreneurship Development Programmes (EDP/WEDP/TEDP), EDI Publication, Entrepreneurship Development Institute of India, Ahmedabad. Available from: http://www.ediindia.org/doc/EDP-TEDP.pdf

E-REFERENCES

1. Jeff Hawkins, " Characteristics of a successful entrepreneur", ALISON Online entrepreneurship courses, "https://alison.com/learn/entrepreneurial-skills
2. Jeff Cornwall, "Entrepreneurship -- From Idea to Launch", Udemy online Education, https://www.udemy.com/entrepreneurship-from-idea-to-launch/

Semester : VII
Course Code :
Course Name : ENVIRONMENTAL STUDIES
Prerequisite :

L	T	P	C
3	0	0	0

C	P	A
2.5	0	0.5

L	T	P	H
3	0	0	3

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	***Describe*** the significance of natural resources and ***explain*** anthropogenic impacts.	Cognitive	Remembering and understanding
CO2	***Illustrate*** the significance of ecosystem, biodiversity and natural geo bio chemical cycles for maintaining ecological balance.	Cognitive	Understanding
CO3	***Identify*** the facts, consequences, preventive measures of major pollutions and ***recognize*** the disaster phenomenon	Cognitive Affecting	Remembering Receiving
CO4	***Explain*** the socio-economic, policy dynamics and ***practice*** the control measures of global issues for sustainable development	Cognitive	Understanding and Analyse
CO5	***Recognize*** the impact of population and ***apply*** the Environmental ethics towards environmental protection.	Cognitive	Understanding And Apply

COURSE CONTENT

UNIT I **INTRODUCTION TO ENVIRONMENTAL STUDIES AND RESOURCES** **12**

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, flood, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and

desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT II ECOSYSTEMS AND BIODIVERSITY 8

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity - Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India Threats to biodiversity : Habitat loss, poaching of wildlife, man---wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III ENVIRONMENTAL POLLUTION 8

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: flood, earthquake, cyclone and landslide.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context. Issues involved in enforcement of environmental legislation – Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 8

Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies. Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

L	T	P	Total
45	0	0	45

Semester	**TRACK – I**	
Subject Name	**RENEWABLE ENERGY SOURCES**	
Subject Code	**XMEE04 / XMEOE2**	
L –T –P –C	**C:P:A**	**L –T –P –H**
3- 0 – 0– 3	**3:0:0**	**3- 0– 0– 3**

Course Outcome		**Domain/Level C or P or A**
CO1	To know the energy demand of world, nation and available resources to fulfill the demand	C (Understand), A
CO2	To know about the problems associated with the conventional energy resources for sustainable development	C (Understand), A
CO3	To know about the exploration of nonconventional energy resources and their effective tapping technologies	C (Understand), A
CO4	To acquire the knowledge of modern energy conversion technologies	C (Understand apply), A
CO5	Select appropriate energy conservation method to reduce the wastage of energy	C (understand), A

COURSE CONTENT

UNIT I	**ENERGY AND ENVIRONMENT**	**10 hrs**

Primary energy sources - world energy resources - Indian energy scenario - energy cycle of the earth –environmental aspects of energy utilization, CO_2 emissions and global warming, Carbon cycle – renewable energy resources and their importance. Potential impacts of harnessing the different renewable energy resources.

UNIT II	**BIO ENERGY**	**9 hrs**

Energy from bio mass & bio gas plants - various types - design principles of biogas plants - applications. Industrial, municipal and agricultural waste to Energy, Incineration - advantages and limitations – Bio fuels – types, production methods, properties and applications.

UNIT III	**SOLAR ENERGY**	**10 hrs**

Principles of solar energy collection -.solar radiation - measurements - instruments - types of collectors - characteristics and design principles of different type of collectors - performance of collectors. Solar thermal applications – water heaters and air heaters - performance and applications - simple calculations - solar cooling - solar drying - solar ponds - solar tower - solar furnace.

UNIT IV	**WIND, TIDAL AND GEO THERMAL ENERGY**	**9hrs**

Energy from the wind - general theory of windmills - types of windmills - design aspects of horizontal axis windmills - applications. Energy from tides and waves – working principles of tidal plants and ocean thermal energy conversion plants - power from

geothermal energy - working principle of geothermal power plants

UNIT V ENERGY CONSERVATION AND AUDIT 7 hrs

Energy Conservation, Energy Audit and Energy Management-Principles and Techniques.

L = 45 hrs Total = 45 hrs

TEXT BOOKS

1.. Rai G.D, "Non conventional Energy sources" (1999) Khanna Publishers, New Delhi

2. Duffie and Beckmann, "Solar Energy Thermal Processes, John Wiley, 1974.

REFERENCES

1. Sukhatme, S.P., Solar Energy, 2nd edition, TMH, 2003

2. Sulton, "Direct Energy Conversion", McGraw-Hill, 1966.

3. Garg. H. P and Prakash. J., "Solar Energy - Fundamentals and applications", TMH, New Delhi, 1997.

4. Ashok V Desai, "Non-conventional Energy", Wiley Eastern Ltd, New Delhi, 1990

E-REFERENCES

1. http://nptel.iitm.ac.in/courses

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	0	0	0	1	0	1	1	0	1	1		3
CO2	3	3	1	0	1	1	0	2	3	1	3	3		3
CO3	3	3	2	1	1	1	0	2	3	2	3	3		3
CO4	3	3	3	0	2	2	1	3	3	2	3	3		3
CO5	1	1	1	0	0	0	0	1	1	1	2	2		3
	13	**11**	**7**	**1**	**4**	**5**	**1**	**9**	**11**	**6**	**12**	**12**		**15**

1 - Low , 2 – Medium , 3- High

Semester	**TRACK-I**
Subject Name	**Energy Conservation and Management**
Subject Code	**XMEE06**

L –T –P –C	**C:P:A**	**L –T –P –H**
3- 0 – 0– 3	**3:0:0**	**3- 0– 0– 3**

Course Outcome		**Domain/Level C or P or A**
CO1	Remember and *Understand* about the Energy scenarios.	C (Rem),
CO2	*Understand* about the energy conservation techniques.	C (Rem)
CO3	*Understand* about the energy conservation in various thermal applications.	C (Rem)
CO4	*Understand* about the energy conservation in various mechanical applications.	C (Understand)
CO5	*Remember* and *Understand* about energy economics.	C (understand)

COURSE CONTENT

UNIT I	**Introduction**	**9 hrs**
	Introduction to energy & power scenario of world, National Energy consumption data, and environmental aspects associated with energy utilization; Energy Auditing- need, types, methodology and barriers, role of energy managers, instruments of energy auditing.	
UNIT II	**Energy Conservation**	**9hrs**
	Components of EB billing, HT and LT supply, transformers, cable sizing; Concept of capacitors, power factor improvement, harmonics; Electric motors- motor efficiency computation, energy efficient motors; Illumination- Lux, Lumens, types of lighting, efficacy, LED lighting and scope of energy conservation in lighting.	
UNIT III	**Energy conservation in Thermal systems**	**9hrs**
	Thermal systems, Boilers, Furnaces and Thermic Fluid heaters- efficiency computation and energy conservation measures; Steam distribution and usage, steam traps, condensate recovery, flash steam utilization; Insulation & Refractories.	
UNIT IV	**Energy conservation in Mechanical systems**	**9hrs**
	Energy conservation in major utilities; pumps, fans, blowers, compressed air systems, Refrigeration& Air Conditioning systems, Cooling Towers, DG sets.	
UNIT V	**Energy Economics**	**9 hrs**
	Energy Economics- discount period, payback period, internal rate of return, net present value; Life Cycle costing- ESCO concept.	

L = 45 hrs Total = 45 hr

TEXT BOOKS

1.Witte L.C. , Schmidt P.S. and Brown D.R., Industrial Energy Management and Utilization, Hemisphere Publ., Washington, 1988..
2. Callaghn P.W., Design and Management for Energy Conservation, Pergamon Press, Oxford, 1981.
3. Murphy W.R. and McKay G., Energy Management, Butterworths, London, 1987.
4. Energy Manager Training Manual , Bureau of Energy Efficiency (BEE) under Ministry of Power, GOI, 2004 (available at www.energymanager training.com).

E-REFERENCES

1. http://nptel.iitm.ac.in/courses

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	-	-	-	-	1	-	-	1		3
CO2	2	2	-	1	-	1		-	-	-	-	1		3
CO3	2	3	2	2	1	1	1	-	1	-	-	1		3
CO4	1	1	3	-	2	1	1	2	-	-	-	1		3
CO5	1	-	2	3	2	1	1	-	-	-	-	1		3
TOT	9	7	8	7	5	4	3	2	2			5		15

1 - Low , 2 – Medium , 3- High

Semester	**TRACK-III**
Subject Name	**Total Quality Management**
Subject Code	**XMEE19**

L –T –P –C	**C:P:A**	**L –T –P –H**
3- 0 – 0– 3	**3:0:0**	**3- 0– 0 – 3**

Course Outcome		**Domain/Level C or P or A**
CO1	***List*** and ***Explain*** the basic concepts of total quality concepts and its limitations.	Cognitive (Remembering) (Understanding)
CO2	***Analyze*** and ***Explain*** the Customer satisfaction, Employee involvement, supplier selection and appraise the performance by TQM principle.	Cognitive (Analyzing) (Evaluating)
CO3	***Select*** and ***Explain*** the different TQM tools and their significance.	Cognitive (Remembering) (Understanding)
CO4	***Explain*** and ***Apply*** the Statistical Process Control Tools.	Cognitive (Understanding) (Applying)
CO5	***Explain*** the importance aspects of different quality systems.	Cognitive (Understanding)

COURSE CONTENT

UNIT I	**INTRODUCTION**	**9 hrs**

Introduction, need for quality, evolution of quality; Definitions of quality, product quality and service quality; Basic concepts of TQM, TQM framework, contributions of Deming, Juran and Crosby. Barriers to TQM; Quality statements, customer focus, customer orientation & satisfaction, customer complaints, customer retention; costs to quality.

UNIT II	**TQM PRINCIPLES**	**9 hrs**

TQM principles; leadership, strategic quality planning; Quality councils- employee involvement, motivation; Empowerment; Team and Teamwork; Quality circles, recognition and reward, performance appraisal; Continuous process improvement; PDCE cycle, 5S, Kaizen; Supplier partnership, Partnering, Supplier rating & selection.

UNIT III	**TQM TOOLS**	**9 hrs**

The seven traditional tools of quality; New management tools; Six sigma- concepts, methodology, applications to manufacturing, service sector including IT, Bench marking process; FMEA- stages, types.

UNIT IV	**STATISTICAL PROCESS CONTROL (SPC)**	**9 hrs**

TQM tools and techniques, control charts, process capability, concepts of six sigma, Quality Function Development (QFD), Taguchi quality loss function; TPM- concepts, improvement needs, performance measures.

UNIT V	**QUALITY SYSTEMS**	**9 hrs**

Quality systems, need for ISO 9000, ISO 9001-9008; Quality system- elements, documentation,; Quality auditing, QS 9000, ISO 14000- concepts, requirements and benefits; TQM implementation in manufacturing and service sectors.

L = 45 hrs T = 0 hrs P=0 hrs Total = 45 hrs

TEXT BOOKS

1. Besterfield D.H. et al., Total qualityManagement, 3rd ed., Pearson Education Asia, 2006.
2. Evans J.R. and Lindsay W.M., The management and Control of Quality, 8th ed., first Indian edition, Cengage Learning, 2012.
3. Janakiraman B. and Gopal R.K., Total Quality Management, Prentice Hall India, 2006.
4. Suganthi L. and Samuel A., Total Quality Management, Prentice Hall India, 2006.

REFERENCES

1. Feigenbaum, A.V., "Total Quality Management", McGraw Hill, 1991.
2. Oakland, J.S., "Total Quality Management", Butterworth Heineman, 1989.
3. Narayana V. and Sreenivasan, N.S., "Quality Management – Concepts and Tasks", New Age International, 1996.
4. Zeiri, "Total Quality Management for Engineers", Wood Head Publishers, 1991.

E-REFERENCES

1. http://nptel.ac.in/faq/110101010/Prof.IndrajitMukherjee,IIT,Bombay and Prof. Tapan P.Bagchi, IIT, Kharagpur.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	1	-	-	3	-	2	-	2	3	3	2	
CO2	2	3	3	2	3	2	-	3	2	2	3	3	2	
CO3	3	3	3	3	3	3	1	2	1	2	2	2	2	
CO4	3	2	3	3	3	3	-	2	2	2	3	3	2	
CO5	-	2	2	-	-	1	-	1	1	2	-	-	2	
	10	**10**	**12**	**8**	**9**	**12**	**1**	**10**	**6**	**10**	**11**	**11**	**10**	

1 - Low, 2 – Medium, 3- High

M.TECH –RENEWABLE ENERGY – FULL TIME – Syllabuses

YRE101- SOLAR ENERGY SYSTEMS 3 0 0 3

(Use of approved data book permitted in the examination)

UNIT - I SOLAR RADIATION 9

Source of radiation – Sun earth relationship- extra terrestrial radiation.– Atmospheric attenuation – terrestrial radiation-radiation on a horizontal surfaces and inclined planes-relations between horizontal radiation and inclined surfaces – relations between monthly, daily and hourly radiation and components of the radiations– solar charts – Critical radiation-Measurement of global, direct and diffuse solar radiation- pyroheliometer, pyranometer, pyrogeometer, net pyradiometer-sunshine recorder – an overview of solar radiation data in India.

UNIT – II SOLAR COLLECTORS – FLAT PLATE COLLECTORS 9

Design considerations – classification- Flat plate collectors- air heating collectors liquid heating – Temperature distributions- Heat removal rate- Useful energy gain – Losses in the collectors-for efficiency of flat plate collectors – selective surfaces – tubular solar energy collectors analysis of concentric tube collector – testing of flat plate collectors. Solar green house. Solar tracking. solar kilns

UNIT- III CONCENTRIC SOLAR COLLECTORS AND THERMAL APPLICATION 9

Concentric collectors-Limits to concentration – concentrator mounting – tracking mechanism - performance analysis focusing solar concentrators: Heliostats. Solar powered absorption A/C system (Ammonia/water) solar water pump, solar chimney, solar drier, solar dehumidifier, solar still, solar cooker.

UNIT – IV SIMULATION AND ENERGY STORAGE 9

Simulation in Solar Process Design- TRANSYS- Design of active systems- f chart methods for liquid and air heaters- phi bar, of chart method - sensible, latent heat and thermo-chemical storage-pebble bed etc. materials for phase change- Glauber's salt-organic compounds -solar ponds.

UNIT- V SOLAR PV SYSTEM 9

Photovoltaic cell – characteristics -maximum power- tracking-cell arrays-power electric circuits for output of solar panels--inverters-batteries-charge regulators, Construction concepts. Latest trends in PV systems, Life cycle analysis of solar energy system time value of money, evaluation of carbon credit of solar energy system.

A compulsory seminar / assignment on design / case study/analysis /application in any one of the solar thermal energy system

L:45; T:15; Total:60

TEXT BOOKS:

1. DuffieJ.A and Beckman, W.A., "Solar Engineering of Thermal Processes", 2nd Edition, John Wiley& Sons Inc., Newyork, 1991
2. G.N. Tiwari."Solar Energy ; Fundamentals ,design,modelilg and applications " Third RePrint , Narosa Publishing House, New Delhi,2006

REFERENCES:

1. Edward E.Anderson, “Fundamentals for Solar Energy Conversion”, Addison Wesley pubCO.,1983.
2. Fank Kreith,,Jan F.Kreider,:Principles of solar Engg”, 1978.
3. Koushika M.D,” Solar Energy Principles and Applications”, IBT publications and distributors, 1988.
4. Kaushik S.C, Tiwari G.N and Nayak J.K, “Thermal control in passive solar buildings” .IBT Publishers & Distributors, 1988.

YRE 102 - WIND ENERGY, TIDAL ENERGY AND OTEC 3 0 0 3

UNIT - I MEASUREMENT TECHNIQUES 12

(Use of approved data book permitted in the examination)

Introduction-measurement and instrumentation-Beau fort number Guest parameters-wind type-power law index betz constant Terrain value.Wind speed characterization-site survey and site analysis -Energy in wind-Highest, lowest wind speeds-wind speed for return periods-study of wind applicable Indian standards-steel Tables, Structrual Engineering.

UNIT - II WINDMILL AND WIND TURBINE 10

Wind mill characteristics – types of wind mills- performance analysis -Merits and limitation-variables in wind energy conversion system-wind power density-power in a wind stream-wind turbine efficiency-power of a wind turbine for given in-coming wind velocity - forces on the blades of a propeller-examples of wind farm site-mean wind velocity-wind velocity duration curve-energy pattern factor-wind power duration characteristics - Tip speed ratios - Solidity curves.

Terms-study of all types of turbines (HAWT, VAWT)-typical large capacity wind turbines-sizing-tower design-power duration curves-wind rows diagrams –study of characteristics-actuator theory –analysis of Hourly, daily, monthly, annual, wind behavior-control and instrumentations. syncln & power stabilization synchronization & power stabilization.

UNIT - III POWER GENERATION AND HYBRIDISATION 10

Types of wind energy system-alternators -Grid-combination of diesel generator, Battery storage-wind turbine circuits-wind map of India-Wind farm-indefinitely developed wind turbine-study of various wind turbines manufactured indigenously - kilowatt rating-retrofits-R&M-OP & FC-speed limitation-fatigue stress.

UNIT - IV WAVE AND TIDAL ENERGY 7

Wave energy -Tidal changes – Ecological changes – Types Tidal Power – Energy from Sea – Tidal Turbines – Tidal Power Generation – Recent Trends and Developments – Problems and solutions – Case Studies.

UNIT - V OTEC 6

The concepts- construction and operational problems – history of OTEC development Alternative energy technology – Ocean thermal energy conversion – Techniques – Problems and solutions – Case Studies-ecological and environmental aspects.

A compulsory seminar / assignment on design / case study/analysis /application in any one of the Wid energy,Tidal and OTEC

L:45; Total:45

TEXT BOOKS:

1. E.L Wakil ”Power plant technology”, McGrawGill Publishers,New York
2. G. D Rai “Non Conventional Energy sources” Khanna publishers. New Delhi

REFERENCES:

1. S.Rao & B.B.Parulekar,"Energy Technology", 3rd edition,Khanna publishers,1995.
2. Anna Mani & Dr.Nooley,"wind Energy Data for India", 1983.
3. IS 875 part IV and IS 1893 material STDS IS 226 (IS 2862, ASTM A-36, BS. 4360 Gr 43 D)
4. Logan (EARL),"Turbo Machinary Basic theory and applications", 1981.

YRM107 (*) – Research Methodology and IPR (MC) 2 0 0 0

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2: Effective literature studies approaches, analysis Plagiarism, Research ethics,

Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2 nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007. Mayall , "Industrial Design", McGraw Hill, 1992.
5. Niebel , "Product Design", McGraw Hill, 1974.
6. Model Curriculum of Engineering & Technology PG Courses [Volume -II] 125 Asimov, "Introduction to Design", Prentice Hall, 1962.
7. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
8. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

YEGOE1 - ENGLISH FOR RESEARCH PAPER WRITING

UNIT 1:- Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

4

UNIT 2:- Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

4

UNIT 3:- Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

4

UNIT 4:- key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

4

UNIT 5:- Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

4

UNIT 6:- useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

YRE 201 - BIO ENERGY SYSTEMS 3 0 0 3

UNIT- I BIO FULES 9

Bio fuels: types, Properties and sources- Bio fuels first, second and third generation production processes and technologies- Bio diesel comparison with diesel - Biofuel applications – Bio diesel and Ethanol as a fuel for I.C. engines - Relevance with Indian Economy - Bio-based Chemicals and Materials - Commercial and Industrial Products - Govt. Policy and Status of Bio-fuel technologies in India.

UNIT - II CHARACTERISATION OF BIOMASS 9

Biomass: Sources and Classification. – Properties - Energy plantation - Preparation of biomass. Size reduction- Briquetting of loose biomass - Drying, storage and handling of biomass. Conversion of biomass. Biomass processing for liquid and gaseous fuel production. Effect of

particle size, temperature, on products obtained – Processing of various biomass for gas production for Thermal and Electrical application.

UNIT- III BIOGAS TECHNLOGY 10

Feed stock for biogas production, animal residues, Aqueous wastes containing biodegradable organic matter- Microbial and biochemical aspects- factors and operating parameters for biogas production- Kinetics and mechanism-Dry and wet fermentation. Digesters-types-digesters for rural application – High rate digesters for industrial waste water treatment

UNIT- IV GASIFICATION OF BIOMASS 10

Thermo chemical Principles: Effect of pressure, temperature and introducing, steam and oxygen. Design and operation of fixed and fluidized bed Gasifier, circulating fluidized bed gasifiers, Safety aspects, operating characteristics of moving bed and fluidized bed gasifier- different types- advantages and disadvantages- performance analysis of gasifiers.

UNIT – V COMBUSTION OF BIOMASS & COGENERATION SYSTEMS 7

Combustion of woody biomass – theory, calculations and design of equipments, Cogeneration in biomass processing industries. – Economic Case studies: Combustion of rice husk. Use of bagasse for cogeneration.

A compulsory seminar / assignment on design / case study/analysis /application in any one of the Bio Energy systems

L:45; Total:45

TEXT BOOKS;

1. Chakraverthy A, “Biotechnology and Alternative Technologies for Utilisation of Biomass or Agricultural Wastes”, Oxford & IBH publishing Co, 1989.
2. Mittal K.M “ Biogas Systems : “Principles and Applications” New age international publishers (P) Ltd 1996, Nijaguna, B.T Biogas Technology, New age International publishers (P) Ltd

REFERENCES:

1 Venkata Ramana P and Srinivas S.N, “Biomass Energy Systems”, ISBN 81-85419- 25-6, Tata Energy Research Institute, 1996.
3. Klass D.L and Emert G.M, “Fuels from Biomass and Wastes”, Ann Arbor Since Publ. Inc. Michigan, 1985.
4. O.P.Chawla, “Advances in Bio-gas Technology” I.C.A.R., New Delhi, 1970.

YRE104C - FUELS AND COMBUSTION TECHNOLOGY 3 0 0 3

UNIT – I FUELS, FUEL ANALYSIS & COMBUSTION STOICHIOMETRY 8

FUELS & FUEL ANALYSIS: Types of fuel-Physical and chemical characteristics of solid, liquid, and gaseous fuels-Nonconventional fuel-producergas, hydrogen, biogas etc- Determination of Calorific values-Ultimate and proximate analysis-problems associated with handlings, storage and combustion

COMBUSTION STOICHIOMETRY

Stoichiometry relations – conservation of mass principles – theoretical & actual combustion processes – calculation of air fuel ratio for a fuel of known combustion – calculation of flue gas composition of fuel and excess air supplied from exhaust gas analysis – combustion calculation with sub- stoichiometry air – calculation of atmospheric air moisture – Dew point temperature of the combustion products – Flue gas analysis- Boiler performance analysis

UNIT - II THERMODYNAMICS OF COMBUSTION PROCESSES 10

COMBUSTION KINETICS: Degree of reactions-reactions equilibrium-Laws of mass action-criteria of equilibrium-heat and temperature-Gibbs free energy – equilibrium constant-Vant hoffs isotherm – rate of reaction-factors affecting rate of reaction-calculation of equilibrium constant and composition of reating systems .

UNIT- III FLAME, FLAME STRUCTURE, IGNITION AND IGNITORS 10

Flame – flame structure – flame propagation – deflagaration – detonations – flame front – Ignition – self & forced ignition – Ignition temperature & ignition limits – Factors influencing ignition – SIT – Ignition lag – limits of inflammability & its determination – factors affecting inflammability limits – calculation of inflammability limits – flame blow off, blow out & flash back – flame quenching, Flame structure – flame stability – premixed & diffused flames – velocity of flame propagation – various methods of flame stabilization – swirl number & its significance – Turndown ratio – Ignitors – various types of ignitors – NFPA class I, II & III ignitors – Eddy plate ignitor – plasma ignitor – High energy Arc ignitor – DIPC ignitor.

UNIT- IV BASICS OF FURNACES 10

Industrial furnaces – process furnaces Steam generating furnaces – Kilns – Batch & continuous furnaces – Advantages of ceramic coating – Heat source – Distributions of head source in furnaces – Blast furnace – open hearth furnace – pot & crucible furnaces – waste heat recovery in furnaces – Recuperator – Regenerators – Furnace atmospheres – Furnace Insulation – Furnace Heat balance calculations, Pipe still Heater.

UNIT - V COAL BURNING EQUIPMENTS 7

Coal burning methods – over feed & underfeed supply of coal – Mechanical Stokers – Travelling grate & spreader stoker – vibrating grate stoker – Advantages & disadvantages of stoker firing over pulverized systems of firing – problems encountered with burning of high ash coal. Pulverized fuel burners – streamlined burner – turbulent burners – Tangential burner – cyclone burner – special type burners.

A compulsory seminar / Assignment on design /case study / Analysis/ Application in any one of the combustion system and accessories (viz Burner,Draught etc)

L:45; Total:45

Text Books:

1. Dr. SamirSarkar, “Fuels & Combustion”, Orient Longman, Second edition, 1990.
2. Gupta O.P. “Elements of Fuels, Furnaces & Refractories”, 3rd edition, Khanna Publishers, 1996.

REFERENCES:

1. S.P. Sharma & Chander Mohan, “Fuels & Combustion”, Tata McGraw Hill Publishing Co.Ltd., 1984

2. J.D. Gilchrist, “Fuels, Furnaces & Refractories”, Pergamon Press, ISBN-008-029430-9 ----
3. Blokh A.G. “Heat Transmission in Steam Boiler furnaces”, Hemisphere Publishing Corpn.ISBN-089-116-626-2

YRE105A - ENVIRONMENTAL ENGINEERING 3 0 0 3

UNIT - I ENVIRONMENTAL POLLUTION 10

Mass and energy transfer – units of measurements, material balance and energy fundamentals – Environmental chemistry stoichiometry, chemical equilibria. Mathematics of growth – exponential growth, resource consumption and population growth, resource consumption and population growth – problems. Atmosphere – Regions of atmosphere – Earth's natural atmosphere – consequences of population growth – classification of pollution – pollution of Air, Water & Soil – Effect of pollutants on living system – Environmental legislation.

UNIT - II AIR POLLUTION CONTROL METHODS & EQUIPMENT 10

Sources of air pollution –classification & properties of air pollutants – scales of concentration – Effects of air pollution – meteorological aspects of air pollution – urban air pollution – carbon-di-oxide & climate change – Acid deposition – Industrial air pollution – Automobile air pollution – Sampling, measurement and analysis of air pollutants such as SOx, NOx, CO, NH_3, CnHn, SPM, Opacity, Volatile organic compounds, Trace metals.

UNIT - III WATER POLLUTION 9

Water Sources – Origin of waste water – Classification of Water Pollutions – Effects of water pollutants – Water Pollution Laws and Standards – Water Pollution & Health – Waste Water Sampling – BOD – COD analysis – Waste Water Treatment – primary treatment – secondary treatment – Advanced waste water treatment – Anaerobic Digestion. Desalination – micro filtration – ultra filtration – Reverse Osmosis.

UNIT - IV SOLID WASTE DISPOSAL 9

Solid waste- Sources, types, Compositions and Properties - Land Fill Method of Solid Waste Disposal – Land Fill Classification, Types, Methods and Sitting Consideration – Layout and Preliminary Design of Land Fills – Composition, Characteristics, generation, Movement and Control of Landfill Leach ate and Gases – Environmental Monitoring System for Land Fill Gases.

UNIT - V OTHER TYPES OF POLLUTION 7

Noise Criteria - Noise Sources - Noise Control Measures - Thermal Pollution - Oil pollution – Pesticides - Radioactivity Pollution control - Tanneries and other Industries and their control

L:45, Total: 45

TEXT BOOKS

1. James Gilbert M.Masters, "Introduction to Environmental Engineering And Science", 2nd edition, Prentice Hall, 1998.

REFERENCES:

1.Rao C.S Environmental Engineering and Pollution Control, 1st edition, New Age International Publishers, 1991.

YRE105B - CARBON SEQUESTRATION AND TRADING 3 0 0 3

UNIT - I GREENHOUSE GAS 9

Stabilization of greenhouse gas concentrations – greenhouse gas risks and reservoirs – green gas mitigation – Carbon di oxide and climate change, acid rain, global warming, impacts of global warming- Kyeto-procal.

UNIT - II CARBON 9

Practices for sequester carbon - car bon sequestration types – carbon credits – carbon testing – potential for carbon sequestration.

UNIT - III MANAGEMENT 9

Risk management and risk reduction – carbon economics – Verification of carbon change.

UNIT - IV CASE STUDIES 9

Carbon trading model – Century Model – Case Studies.

UNIT - V RULES AND REGULATIONS 9

Implication Methanol and Nitrous Oxide carbon bank – Best Management Practices 0 Publics issues – policies.

L:45; Total:45 implication

TEXT BOOKS

1. Emission Trading:Environmental Policies New approach-Richard F. Kosobud, Douglas L. Schreder, Holly M. Biggs Published 2000 John Wiley and Sons.

REFERENCES:

1 Agricultural Practices and Policies for Carbon Sequestration in Soil By John M. Kimble, Rattan Lal Published 2002CRCPress

2. The Impact of Carbon Dioxide and Other Greenhouse Gases on Forest Ecosystems By David F. Karnosky Published 2001 CABI Publishing.

YRE105C- WASTE MANAGEMENT AND ENERGY RECOVERY 3 0 0 3

UNIT – I SOLID WASTE 8

Definitions – Sources, types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste.

UNIT – II WASTE TREATMENT 8

Size Reduction – Aerobic Composting – Incineration – Furnace Type and Design, Medical/Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT – III WASTE DISPOSAL 9

Land Fill Method of Solid Waste Disposal – Land Fill Classification, Types, Methods and Sitting Consideration – Layout and Preliminary Design of Land Fills – Composition, Characteristics, generation, Movement and Control of Landfill Leachate and Gases – Environmental Monitoring System for Land Fill Gases.

UNIT – IV HAZARDOUS WASTE MANAGEMENT 10

Definition and Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling Assessment of Hazardous Waste – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation and Closure.

UNIT – V ENERGY GENERATION FROM WASTE 10

Types – Biochemical Conversion – Sources of Energy Generation – Industrial Waste, Agro Residues – Anaerobic Digestion – Biogas Production - Types of Biogas Plant Thermochemical Conversion – Sources of Energy Generation – Gasification – Types of Gasifiers – Briquetting – Industrial Applications of Gasifiers – Utilization and Advantages of Briquetting – Environment Benefits of Biochemical and Thermochemical Conversion. **L:45; Total:45**

REFERENCES:

1. Parker, Colin & Roberts, Energy from Waste – An Evaluation of Conversion Technologies, Elsievier Applied Science, London, 1985.
2. Shah, Manoj Datta, Waste Disposal in Engineered Landfills, Narosa Publishing House, 1997.
3. Rich, Gerald et.al., Hazardous Waste Management Technology, Podevan Publishers, 1997.
4. Bhide AD., Sundaresan BB, Solid Waste Management in Developing Countries, INSDOC, New Delhi, 1983.

YRE204A - OPTIMUM UTILISATION OF HEAT AND POWER 3 0 0 3

UNIT - I ENERGY CONVERSION TECHNIQUES 12

Energy resource assessment – energy supply, demand and storage planning methods – economic feasibility and assessment methods – energy transfer and conversion methods – thermodynamic and efficiency analysis methods – system analysis methodologies.

UNIT - II TOTAL ENERGY SCHEMES 12

Basic concepts of CHP – The benefits of CHP – Problems associated with CHP – The balance of energy demand – Types of Prime demand – Types of prime movers – The economics of CHP generation – CHP in the industrial sector – CHP in the commercial sector – CHP in the domestic sector district heating – Conclusions.

UNIT - III PROCESS INTEGRATION AND PINCH TECHNOLOGY 10

Pinch Technology – Basic concepts of pinch technology – Streams networks – The significance of the Pinch – Design of energy recovery systems – Selection of pinch temperature difference – Tabular method – Stream splitting – Process retrofit – Installation of heat pumps – Installation of heat engines – The grand composite curve – General comments about process integration.

UNIT - IV ENERGY RECOVERY 6

Insulation – Recuperative heat exchanger – Run -around coil systems – Regenerative heat exchangers – Heat pumps – Heat pipes – Selection of energy recovery methods, Cogeneration.

UNIT - V APPLICATION OF CHP 5

CHP in agricultural sector - processing - energy requirements - potential. CHP in industrial sector - Processing - energy requirements - source of waste heat.

L:45; Total:45

Text Books;

1. Eastop T.D & Croft D.R, "Energy efficiency for engineers and Technologists", 2nd edition, Longman Harlow, 1990.

REFERENCES:

O'Callaghan, Paul W, "Design and Management for energy conservation", Pergamon, ,1993

YRE204C – SUSTAINABLE DEVELOPMENT 3 0 0 3

UNIT - I INTRODUCTION **12**

Industrial activity and Environment industrialization and sustainable development – Industrial Ecology – Prevention versus control of industrial pollution – Regulations to encourage cleaner production based approached.

UNIT - II CLEANER PRODUCTION CONCEPT **7**

Importance – Historical evolution – Benefits – promotion – barriers – Role of Industry, government and Institutional – Resume, recovery, recycle, substitution – Internet information & other CP resources.

UNIT- III CLEANER PRODUCTION PROJECT DEVELOPMENT **10**

Overview of CP Assessment steps & skills – preparing for the site – material balance – Technical and Environmental feasibility analysis – Economic Evolution of alternatives – Total cost analysis – CP financing - Established programme – Preparing & programme plan – reset audit – Environmental statement

UNIT - IV LIFE CYCLE ANALYSIS & ENVIRONMENTAL MANAGEMENT SYSTEM **8**

Elements of LCA - life cycle costing – ECO labelling - Design for the Environment Environmental standards – ISO 14001 – Environmental audit.

UNIT - V CASE STUDY **8**

Industrial application of CP, LCA, EMS & Environmental audit
L:45; Total: 45

REFERENCES:

1. Pollution prevention: Fundamental and Practice, Paul L Bishap, McGrawhill , INC
2. Pollution prevention and abatement Handbook – Towards cleaner production – World bank and UNDP, Washinghton, D.C
3. Cleaner Production Audit, Prasad Modak, Asian Institute of Technology, Bangkok

YRE 205B - HYDROGEN AND NUCLEAR ENERGY **3 0 0 3**

UNIT - I HYDROGEN ENERGY **9**

Hydrogen as a renewable energy source - Sources of Hydrogen - Fuel for Vehicles - Hydrogen Production - Direct electrolysis of water - direct thermal decomposition of water - biological and biochemical methods of hydrogen production - Storage of hydrogen - Gaseous, Cryogenic and Metal hydride - Utilization of hydrogen.

UNIT - II BATTERIES & FUEL CELL **12**

Battery – Storage cell Technologies -storage cell fundamentals- characteristics – Emerging trends in batteries-Carbon- Zinc & alkaline cells, Mercury, Zinc –air &Silver oxide button cells, Lead acid, Edison, Ni cad & Ni mg cells and lithium Technology

Fuel cell – Principle of working- construction- Design and performance analysis of fuel cells-The alkaline fuel cell, Acidic fuel cells, PEM Fuel cells, SOFC - Emerging trends in fuel cells, - Applications – Industrial and commercial

UNIT - III NUCLEAR POWER **9**

Nuclear energy conversion - Chemical and nuclear equations - Nuclear reactions -Fission and fusion - Energy from fission and fuel burn-up - Radioactivity – Neutron energies - Fission reactor types - Nuclear power plants - Fast breeder reactor and power plants - Production of nuclear fuels.

UNIT - IV NUCLEAR POWER **10**

Fuel rod design - Steam cycles for nuclear power plants - reactor heat removal – Coolant channel orificing - Core thermal design - Thermal shields - Fins in nuclear plants – Core thermal hydraulics - Safety analysis - LOCA - Time scales of transient flow and heat transfer processes.

UNIT - V NUCLEAR WASTE MANAGEMENT **5**

Segregation and safe disposal of nuclear waste –case studies

L:45; Total:45

TEXT BOOKS'

1. M. M. El-Wakil: Power Plant Technology, McGraw Hill, 1985

2. Hand book of Batteries and Fuel cells ,3rd Edision, Edited by David and Thomas, B. Reddy, McGrawhill Book company,N.Y 2002

3. Fuel cell, Principles and applications ,Viswanathan,B and Scibioh,Aulice M. Universities Press.2006

REFERENCES:

1. A. W. Culp Jr: Principles of Energy Conversion, McGraw Hill, 2001

2. Principles of fuel cells by Xianguo Li, Taylor & francis,2006

3. T. F. Morse: Power Plant Engineering, Affiliated East West Press, 1978

4. R. H. S. Winterton: Thermal Design of Nuclear Reactors, Pergamon Press, 1981
5. R. L. Murray: Introduction to Nuclear Engineering, Prentice Hall, 1961

YRE302A ENERGY AUDIT AND MANAGEMENT 3 0 0 3

UNIT - I INTRODUCTION **10**

Energy scenario – Principles and imperatives of energy conversion – Energy consumption pattern – Resource availability – Why save energy – reasons to save energy – an over view of energy consumption and its effects – current energy consumption in India – Role of Energy Managers in Industries.

UNIT - II ENERGY CONSERVATION OF THERMAL UTILITIES **10**

Energy Audit–Characteristic Methods Employed in Certain Energy Intensive Industries – Various Energy Conservation Measures in Steam – Losses in Boiler. Methodology of Upgrading Boiler Performance – Boiler Blow Down Control – Excess Air control – Pressure Reducing Stations. Energy Conservation in Steam Systems – Importance of correct Pressure, Temperature, & Quality of Steam – Condensate Recovery – Condensate Pumping – Thermo Compressors – Recovery of Flash Steam – Air Removal & Venting – Moisture Removal. Steam Traps – Types, Function, Necessity – Section and application. Co-generation – in-plant power generation systems – co-generation Schemes and configuration – Design Considerations – Heat Rate Improvement. Case studies.

UNIT - III ENERGY CONSERVATION OF UTILITIES **10**

Centrifugal pumps – energy consumption & energy saving potentials – Design consideration minimizing over design – case studies – Fans & Blowers – Specification – Safety margin – choice of fans controls – design considerations. Air compressor & compressed air systems – selection of compressed air layout – Encon aspects to be considered at design – Design consideration. Refrigeration & Air conditioning – Heat load estimation – methods of minimizing heat loads – optimum selections of equipments – case studies. Energy conservation in cooling towers & spray ponds – Case studies.

UNIT - IV ENERGY AUDITING **8**

Potential areas for Electrical Energy Conservation in various Industries – Conservation methods – Energy Management Opportunities in Electrical Heating, Lighting System, Cable Selection – Energy Efficient Motors – Factors Involved in Determination of Motor Efficiency Adjustable AC Drivers, Application & its Uses – Variable speed Drivers / Belt Drives Energy Efficiency in Electrical Systems – HT Power Distribution – Control system in HT/LT side, Harmonics – Energy Efficiency in Lighting – Case studies.

UNIT - V ENERGY MANAGEMENT **7**

Organizational background desired for energy management persuation / motivation / publicity role, tariff analysis, detailed process of M&T Energy monitoring, auditing & targeting – Economics of various Energy conservation schemes, instrumentation and calibrationElectronics Control and Industrial Energy Management Systems. Thermostats, Boiler controls; proportional, differential and integral control, optimizers; compensators.

L:45; T:15; Total:60

TEXT BOOKS

1. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists,. Longman Scientific & Technical, ISBN – 0-582 – 03184, 1990.

REFERENCES:

1. Reay D.A, Industrial Energy Conservation, 1st edition, Pergamon Press, 1977.
2. Larry C whitetal, Industrial Energy Management & Utilization.

YREOE1 – HYDRO POWER TECHNOLOGY 3 0 0 3

UNIT - I HYDROLOGY` 9

Overview of Hydropower systems-Preliminary Investigation-Rainfall and run off measurements-Hydrographs-Flow duration graph and mass storage graphs-determination of site selection- Types hydro electric power plants-General arrangements and layouts - preparation of Reports and Estimates-Review of World Resources- Basic Factors in Economic Analysis of Hydropower projects-Project Feasibility-Load Prediction and Planned Development

UNIT- II DEVELOPMENT OF PROTO TYPE SYSTEMS 9

Advances in Planning, Design and Construction of Hydroelectric Power Stations-Trends in Development of Generating Plant and Machinery-Plant Equipment for pumped Storage Schemes-Some aspects of Management and Operations-Updating and Refurbishing of Turbines- case studies

UNIT – III SELECTION AND ANALYSIS OF TURBINES 9

Pelton,Francis and Kaplan Turbine Measurement of pressure head, Velocity-Various parameters for finding out the potential of Hydro energy-Selection of turbines based on specific quantities –case study.

UNIT - IV HYDRO POWER STATION OPERATION, MAINTENANCE AND TROBLE SHOOTING 9

Governing of Power Turbines-Functions of Turbine Governor-Condition for Governor Stability-Surge Tank Oscillation and Speed Regulative Problem of Turbine Governing in Future- Planning, Design and Construction of Hydroelectric Power Stations-Remaining Life cycle analysis

UNIT–V SMALL, MINI AND MICRO HYDRO POWER PLANTS TURBINES 9

Introduction – analysis of micro hydro and mini hydro turbines – Economical and electrical aspects of small, mini and micro hydro turbines potential developments – design reliability of small, mini micro hydro turbines – case studies.

L:45; Total: 45

TEXT BOOKS:

1. P.K Nag “Power plant Engineering” Tata McGrawHill, New Delhi,2004
2. Domkundwar and Arora “a course inPower plant Engineering’’ Khanna publishers, New Delhi

REFERENCES:

1. L.Monition,M.Lenir and J.Roux,Micro Hydro Electric Power Station(1984)
2. AlenR. Inversin,Micro Hydro Power Source Book(1986)

BUSINESS ETHICS, CORPORATE SOCIAL RESPONSIBILITY AND GOVERNANCE

LEARNING OBJECTIVE:

To facilitate a clear understanding of the economic concepts, theory of managerial relevance.

COURSE CODE	COURSE NAME	L	T	P	C
YCO102	BUSINESS ETHICS, CORPORATE SOCIAL RESPONSIBILITY AND GOVERNANCE	3	0	0	3
PREREQUISITES	YCOE305A	L	T	P	H
C:P:A	2.5:0:0.5	3	0	0	3

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Explain*** the factors affecting business ethics and corporate moral excellence.	Cognitive Affective	Understanding Receiving
CO2	***Discuss*** the Ethical issues in Operation and Purchase Management.	Cognitive Affective	Understanding Receiving
CO3	***Examine*** the Ethical issues in Marketing Strategy and consumerism.	Cognitive Affective	Understanding Receiving
CO4	***Describe*** the Ethical issues in Accounting Professional conduct of accountants; ethics and financial statements.	Cognitive Affective	Understanding Receiving
CO5	***Elaborate*** Corporate Social Responsibility (CSR).	Cognitive Affective	Understanding Receiving

Syllabus

Units	Content	Hours allotted
I	**Introduction:** Business Ethics-Definition–Meaning nature and objectives of ethics; Meaning and nature of business ethics; Factors affecting business ethics – Ethical Organization – characteristics of an ethical organization ; Corporate Moral Excellence – Corporate Citizenship Theories of Ethics – Utilitarian, Separatist and integrative view of ethics; Stage of ethical consciousness in business; Relationship between law and moral standards.	10+0+0
II	**Ethical issues in Human Resource Management**: The Principle of ethical Hiring – Equality of opportunity – ethics and remuneration – ethics in retirement Ethical issues in Operation and Purchase Management – Quality Control; Ethical Problems and dilemmas in Operations Management; Role of Purchase Manager – Code of ethics for purchases ; Ethical issues in Global buyer –Supplier relationships.	8+0+0

III	**Ethical issues in Marketing Strategy:** Ethical issues in Marketing Mix – Product – Price – Promotion – Place – Process –People – Physical evidence; Ethical issues and Consumerism – Consumer Protection – Consumer Welfare – Consumer delight – Consumer Rights .	8+0+0
IV	**Ethical issues in Finance:** Ethical issues in mergers and acquisitions – hostile takeovers – insider trading – money laundering; Ethical issues in Accounting Professional conduct of accountants; ethics and financial statements – fictitious revenues – Fraudulent timing differences – Concealed liabilities and expenses – fraudulent-disclosures and omissions – Fraudulent valuation of assets – ethical auditing.	9+0+0
V	**Corporate Social Responsibility:** Meaning– Definition-Methods – Evaluation; Internal Stakeholders – Share holders –employees – management; External Stakeholders – Consumers – Suppliers – Creditors – Competitors – Community; Global and Local issues in Management – Black money – Poverty – Child Labour – Gender equality and so on. Ethical issues in MNCs; - Environmental ethics – environmental issues in India – Greening and green initiatives – Sustainable Development – Waste Management .	10+0+0
	Lecture | **Tutorial** | **Total** **45** | **-** | **45** (Weightage of Marks, theory 100%)	

Text Books

1. Shailendra Kumar Business Ethics First Edition, Cengage Learning India Pvt. Ltd.
2. Niraj KumarMr. Paras Tripathi, Business Ethics, Himalaya Publishing House.

References Books:

1. John R Boatright,(2005), Ethics and the conduct of Business, Pearson Education(Singapore) Pvt.Ltd, Indian Branch, Delhi.
2. Fr.Cyriac K, (1998), Managerial Ethics and Social issues, XLRI, Jamshedpur
3. Fr.McGrarth, (1989), SJ Basic Managerial skills for all, Prentice Hall of India, New Delhi.
4. Davis Keith and Blomstorm, (1987), Business, Society and Environment, Tata McGraw – Hill Ltd, New Delhi.

Semester	**IV**
Subject Name	**SOCIAL ENGINEERING**
Subject Code	**XBE403**

L –T –P –C	**C:P:A**	**L –T –P –H**
2- 0 –0- 2	**1:0.5:0.5**	**2- 0 -0- 2**

Course Outcome:		**Domain C or P or A**
CO1	***Identify*** the origin of caste and race	Cognitive
CO2	***Listen*** the anti caste struggles in modern India and ***react*** with modern Indian movement.	Affective/ Psychomotor
CO3	***Distinguishes*** the gender inequalities	Cognitive

COURSE CONTENT

UNIT-I **Origins of Caste and Race** **12hrs**

India: A Nation of caste and class
Caste and Race: Dravidian and Aryan conflict – An historical Overview

UNIT –II **Anti-caste and race movement in Modern India** **12hrs**

Anti-Caste struggles in Modern India: Mahatma Gandhi and Phule's contribution
Thanthai Periyar Contribution in eradicating social injustice
Ambedhkar's approach to eradication of untouchablity and annihilation of caste in the context of dalit movement in India

UNIT-III **Gender inequality**

Dignity of Labour and Caste: Kancha llaiah's Scientific Method
Women and Caste: Issues of gender of inequality. Empowerment of women

Sessional work :

a) Collection of news papers cutting connected with social issues, caste discrimination, women inequality
b) Conducting social survey in Villages
c) Visiting NGO's activities for women empowerment.

TEXT BOOKS

1 Dr B.R. Ambedhkar and Untouchablity – Fighting the Indian Caste system – Christophe Jattrelot, Columbia University Press, May 2005
2 Collected works of Periyar EVR, Compiled by Dr K. Veeramani, The Periyar Self-Respect Propaganda Institution Periyar Thidal, 50, EVK Sampath Salai, Chennai – 600 007
3 Mahatma Jothipha Phule Life History
4 Dignity of Labour in our time, Prof. Kanch Illaiah, Hyderabad

L-60 hrs P-15hrs Total – 75 hrs

Semester	**VI**
Subject Name	**INDIAN CONSTITUTION AND HUMAN RIGHTS**
Subject Code	**XBE601**

L –T –P –C	**C:P:A**	**L –T –P –H**
2- 0– 0- 2	**2:0:0**	**2- 0 – 0- 2**

Course Outcome:		**Domain C or P or A**
CO1	Know the importance, preamble and salient features of Indian constitution	Cognitive
CO2	Appreciate the significance of fundamental rights, duties and directive principles of state policy	Cognitive
CO3	Develop an understanding of the strength of the union government	Cognitive
CO4	Know the meaning, significance, the growing advocacy of human rights.	Cognitive

COURSE CONTENT

UNIT I INTRODUCTION TO THE CONSTITUTION OF INDIA

Preamble – constitution assembly of India – philosophical foundations of the Indian constitution – fundamental rights – fundamentals duties and the directive principles of the state policy of the Indian constitution – Union Government: structure and functions, State Government: structure and functions – Indian federal system – Parliament – President, Prime Minister – constitutional amendments – constitutional functionaries – assessment of working of the panchayat raj.

UNIT II HUMAN RIGHTS

Meaning, concept – notion and classification of rights: natural, moral and legal rights. Three generations of human rights civil and political rights: economic, social and cultural rights: collective / solidarity rights. Theories of human rights. Rights of the disadvantages groups (SC, ST, OBC, Minorities children and women). Mechanisms for the protection of the rights of disadvantaged groups. Social justice and human rights

L- 30 hrs T-15 hrs Total -45 hrs

TEXT BOOKS

1. Durga Das Basu, “Introduction to the constitution of India”, prentice Hall of India, New Delhi.
2. Jansuez Symonides(ed), 2005. Human Rights, Rawat Publications, Jaipur.
3. Subash C Kashyap, the working of Indian constitution, NBT, New Delhi.
4. Human rights in India: theory and practice. National Book Trust, 2001.

Semester	**III**
Subject Name	**DISASTER PREPAREDNESS & PLANNING**
Subject Code	**XCE 302**
Prerequisite	**Nil**

L	T	P	C
1	1	0	2

C	P	A
3	0	0

L	T	P	H
1	1	0	2

	COURSE OUTCOMES	DOMAIN	LEVEL
CO1	To Understand basic concepts in Disaster Management	Cognitive	Understanding
CO2	To Understand Definitions and Terminologies used in Disaster Management and able to Analyzing Relationship between Development and Disasters	Cognitive & Psychomotor	Understanding Set
CO3	Ability to understand Categories of Disasters	Cognitive & Affective	Remembering
CO4	To Understand the Challenges posed by Disasters	Cognitive & Affective	Remembering
CO5	To understand Impacts of Disasters Key Skills	Cognitive	Understanding

COURSE CONTENT

UNIT I **INTRODUCTION** **3 hrs**

Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation).

UNIT II **DISASTERS** **6 hrs**

Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability, profile of India, mountain and coastal areas, ecological fragility

UNIT III **DISASTER IMPACTS** **6 hrs**

Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT IV **DISASTER RISK REDUCTION (DRR)** **10hrs**

Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT V **DISASTERS, ENVIRONMENT AND DEVELOPMENT** **5hrs**

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods

Lecture	Tutorial	Practical	Total
15	15	0	30

TEXT BOOKS

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of HomeAffairs).
3. PradeepSahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
6. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
7. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

Semester	**III**
Subject Name	**ENERGY SCIENCE AND ENGINEERING**
Subject Code	**XCE 305**
Prerequisite	**Nil**

L	T	P	C
1	1	0	2

C	P	A
3	0	0

L	T	P	H
1	1	0	2

	COURSE OUTCOMES	DOMAIN	LEVEL
CO1	***List*** and generally ***explain*** the main sources of energy and their primary applications nationally and internationally	Cognitive Affective	Understanding & Respond
CO2	***Understand*** effect of using these sources on the environment and climate	Cognitive	Understanding
CO3	***Describe*** the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.	Cognitive	Remembering
CO4	***List*** and describe the primary renewable energy resources and technologies.	Cognitive	Understanding
CO5	***Quantify*** energy demands and make comparisons among energy uses, resources, and technologies.	Cognitive Affective	Understanding & Respond
CO6	***Understand*** the Engineering involved in projects utilizing these sources	Cognitive	Understanding

COURSE CONTENT

UNIT I	**INTRODUCTION TO ENERGY SCIENCE**	**4**
	Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment	
UNIT II	**ENERGY SOURCES**	**5**
	Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)	
UNIT III	**ENERGY AND ENVIRONMENT**	**6**
	Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy	
UNIT IV	**CIVIL ENGINEERING PROJECTS**	**10**
	Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems	

UNIT V	ENGINEERINGFOR ENERGY CONSERVATION	5

Concept of Green Building and Green Architecture; Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption

Lecture	Tutorial	Practical	Total
15	15	0	30

TEXT BOOKS

1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
4. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
5. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley

REFEENCE BOOKS

1. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
2. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company

Semester V

Subject Name	**PROFESSIONAL PRACTICE LAW& ETHICS**
Subject Code	**XMG509**
Prerequisite	**Nil**

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	To Understand the various stakeholders roles and ethics governing the profession	Cognitive	Understanding
CO2	To able to contracts management and dispute resolution mechanisms;	Cognitive	Understanding
CO3	To give an understanding of Intellectual Property Rights, Patents.	Cognitive	Understanding
CO4	Able to understand construction related laws	Cognitive	Understanding
CO5	To develop ideas of the legal and practical aspects of their profession	Cognitive	Understanding

COURSE CONTENT

UNIT I **Professional Practice and Professional Ethics** **9 Hrs**

Respective roles of various stakeholders: Government Agencies (constituting egulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens)-Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Actsand Standards)

Definition of Ethics, Professional Ethics, Business Ethics,Corporate Ethics,Engineering Ethics, Personal Ethics; Code of Ethics as defined in thewebsite of Institution of Engineers (India); Profession, Professionalism, ProfessionalResponsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmentalbreaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing,protected disclosures.

UNIT II **Contracts Management** **9 Hrs.**

Indian Contract Act, 1972 and Amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidateddamages& Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public- Private Partnerships; International Commercial Terms;

UNIT III	**Arbitration, Conciliation and Alternative Dispute Resolution system**	**7 Hrs**

Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration,confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; LokAdalats

UNIT IV	**Labour and Labour& other construction-related Laws**	**11 Hrs**

Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

UNIT V	**Law relating to Intellectual property**	**9 Hrs**

Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relatingto Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;

Lecture	Tutorial	Practical	Total
45	0	0	45

Text Books

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. ProfessionalOffset
3. NeelimaChandiramani (2000), The Law of Contract: An Outline, 2nd Edn. AvinashPublications Mumbai
4. Ethics in Engineering- M.W.Martin&R.Schinzinger, McGraw-Hill
5. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
6. Avtarsingh (2002), Law of Contract, Eastern Book Co.
7. Dutt (1994), Indian Contract Act, Eastern Law House
8. Anson W.R. (1979), Law of Contract, Oxford University Press

References

1. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard, M.J.Rabins
2. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on
3. UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
4. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
5. The National Building Code, BIS, 2017
6. RERA Act, 2017

Web

1. Construction Contracts:http://www.jnormanstark.com/contract.html
2. Contracts Law : http://www.laderapress.com/laderapress/contractslaw1.html
3. Contract&Agreements : http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm
4. Contracts: http://206.127.69.152/jgretch/crj
5. Business & Personal Law: http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt
6. Types Of Contracts And Important Provisions: http://www.worldbank.org/ html/ opr/ consult/guidetxt/types.html
7. Contract Types/Pricing Arrangements: http://www.sandia.gov/policy