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
think • innovate • transform

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

2022-23 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	B.Arch 1. XAR402 Climate and Architecture 2. XCYOE03 Climate change 3. XAR502 Environmental Sciences 4. XAR601 Vernacular Architecture 5. XAR 704 B Disaster Resistance in Architecture 6. XAR 901 Professional Practice and ethics 7. XAR704 Landscape Design 8. XAR 904A Architectural Conservation 9. XAR 904B Landscape Architecture 10. XAR904C Behavioral studies in Built Environment
		M.Arch 11. YAR102 Appropriate Materials and Technology for Sustainable Architecture 12. YAR103 Advanced Studies in Regional and Vernacular Architecture 13. YAR 301 Sustainable Urban Landscape 14. YAR 302 Heritage Conservation Planning 15. YAR 303 Urban Design Practices 16. YAR 304B Energy Simulation and Modelling
2.	Aerospace Engineering	1. XUM106 Constitution of India 2. HSMC (H-102) Universal Human Values 2 : Understanding Harmony 3. XUM507 Essence of Indian Traditional Knowledge 4. XUM607 Constitution of India 5. XUM706 Cyber Security
3.	Biotechnology	1. XUM106 Constitution of India 2. XUM306- Entrepreneurship Development 3. XUM307 Universal Human Values 2: Understanding Harmony 4. XUM406 Disaster Management 5. XUM507-Essence of Indian Traditional Knowledge 6. XUM706 Cyber Security 7. XBTOE1-Intellectual Property Rights 8. XBTOE2-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. XUM505 Constitution of India 5. XCE509 Professional Practice, Law & Ethics
5.	Mechanical Engineering	1. XUM106/XUM506 Constitution of India 2. XUM306 Entrepreneurship Development

		3. XUM307 Universal Human Values 2 : Understanding Harmony and gender 4. XUM706 Cyber Security 5. XGS105 Speech Communication 6. XGS204 Technical Communication 7. XUM405 / XUM601 Economics for Engineers 8. XUM406 Disaster Management 9. XUM706 Cyber Security 10. XMEE04 Renewable Energy Sources 11. XMEE06 Energy Conservation and Management 12. XMEE19 Total Quality Management 13. YRE101 Solar Energy Systems 14. YRE102 Wind, Ocean and Geothermal Energy Systems 15. YRE106 Solar Energy Laboratory 16. YRM107 Research Methodology and IPR 17. YEGOE1 English for Research Paper Writing 18. YRE207 Bio Energy Laboratory 19. YRE201 Bio Energy Systems 20. YPSOE1 Constitution of India 21. YRE104C Fuels and Combustion Technology 22. YRE105A Environmental Engineering 23. YRE105B Carbon Sequestration And Trading 24. YRE105C Waste Management and Energy Recovery 25. YRE204A Optimum Utilization of Heat and Power 26. YRE204C Sustainable Development 27. YRE204D Hydro Power Technology 28. YRE205B Hydrogen, Fuel cells and Nuclear Energy 29. YRE302A Energy Audit and Management 30. QRE303C Sustainable Development 31. QRE401A Hydrogen and Nuclear Energy 32. QREOE1A Energy Audit and Management 33. QREOE1B 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	1. XUM307-Universal Human Values 2: Understanding Harmony 2. XUM009-Economics for Engineers 3. XUM003- Disaster Management 4. XUM601 -Economics for Engineers 5. XUM606 - Disaster Management 6. XUM701 -Cyber Security

.8.	Computer Science and Engineering	1. XUM307 Universal Human Values 2: Understanding Harmony And Gender 2. XUM306 Entrepreneurship Development 3. XUM009 Economics For Engineers 4. XUM003 Disaster Management 5. XUM606 Economics For Engineers 6. XUM704 Biology 7. XUM705 Disaster Management 8. XUM801 Cyber Security
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. XUM306 Disaster Management 3. XES202 Environmental Sciences
11.	Physics	1. XUM001 Human Ethics, Values, Rights, and Gender Equality 2. XUM002 Environmental Studies 3. XUM003 Disaster Management 4. XUM004 Entrepreneurship Development 5. XUM005 Cyber Security
12.	Chemistry	1. XUM106 Human Ethics, Values, Rights and Gender Equality 2. XCYOE3- Climate Change 3. XES202 Environmental Sciences 4. XCYOE2 - Pharmaceutical Chemistry
13.	Mathematics	1. XUM001 Human Ethics, Values, Rights and Gender Equality 2. XUM002 Environmental Studies 3. XUM003 Disaster Management 4. XUM004 Introduction to Entrepreneurship 5. XUM005 Cyber Security
14.	Education	1. XBE403 Social Engineering 2. XBE601 Indian Constitution and Human Rights
15.	Management Studies	1. XUM001 Human Ethics, Values, Rights and Gender Equality 2. XUM002 Environmental Studies 3. YBA103 Economics for Managers 4. XUMA306 Entrepreneurship Development
16.	English	1. XUM001 Human Ethics, Values, Rights and Gender Equality 2. XUM002 Environmental Studies 3. XUM003 Disaster Management 4. XUM004 Introduction to Entrepreneurship Development 5. XUM005 Cyber Security
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

B. ARCH Syllabus

SUBCODE	SUB NAME	L	T	P	C
XAR402	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

COURSE CODE	XCYOE03	L	T	P	SS	C
COURSE NAME	CLIMATE CHANGE	3	0	0	0	3
PREREQUISITES	Not Required	L	T	P	SS	H
C:P:A	2.5:0:0.5	3	0	0	0	3

UNIT-1 BASICS OF WEATHER AND CLIMATE **9**

Introduction to Environment. Evolution of the earth's atmosphere. Characteristics and Structure of Atmosphere, Chemistry of atmospheric particles and gases; smog-types and processes, photochemical processes; ions and radicals in atmosphere. Overview of key concepts – weather and climate; Climatic variability - temperature, humidity, rainfall, wind speed & direction, precipitation. Causes of Climate change- Natural and human causes.

UNIT-2 EARTH'S CLIMATE SYSTEM **9**

Global warming and greenhouse effect – major greenhouse gases, sources and sinks of greenhouse gases; Ozone layer depletion, issues and advance research to protect the Ozone layer and consequences; ground level ozone and air pollution; melting of ice, sea level rise and its impact; Earth's energy balance; Carbon cycle;Heat and cold waves; global dimming; Impact of climate change on economy and spread of human diseases, monitoring and assessment.

UNIT 3: CLIMATE CHANGE AND MITIGATION MEASURES **9**

Definitions of mitigation and an overview of emissions levels and mitigation targets per country. CDM and Carbon Trading -Clean Technology, biodiesel, compost, biodegradable plastics - Renewable energy usage as an alternative -Mitigation Technologies and Practices within India and around the world -Non-renewable energy supply to all sectors -Carbon sequestration - International and regional cooperation for waste disposal, biomedical wastes, hazardous wastes,

e-wastes, industrial wastes, etc.,

UNIT 4: CLIMATE CHANGE MODELS	**9**

Constructing a climate model – climate system modeling – climate simulation and drift – Evaluation of climate model simulation – regional (RCM) – global (GCM) – Global average response to warming – climate change observed to date.

UNIT 5: GLOBAL AND NATIONAL INITIATIVES IN CLIMATE CHANGE	**9**

Climate Change and Carbon Credits-Clean Development Mechanism (CDM), CDM in India. United Nation Framework Convention on climate change (UNFCCC) – Key provisions of the UNFCCC, its structure, and different party groups under the convention. The Kyoto protocol and its associated bodies. National Projects related to climate change. Main climate change negotiations evolved over the past years and highlights of some key issues relevant to future climate change regime.

	LECTURE	**SELF STUDY**	**TOTAL**
	45		**45**

REFERENCES

TEXT BOOKS:

1. Robin Moilveen,Fundamentals of weather and climate (2nd Edition) (2010), Oxford University Press.
2. Hardy, J.T.Climate Change: Causes, Effects and Solutions. John Wiley &Sons(2003).
3. Harvey, D. Climate and Global Climate Change. Prentice Hall (2000).
4. J. David Neelin, Climate change and climate modeling, (2011) Cambridge University press.

REFERENCE BOOKS:

1. Barry, R. G. Atmosphere, Weather and Climate. Routledge Press, (2003), UK.
2. Gillespie, A. Climate Change, Ozone Depletion and Air Pollution: Legal Commentaries with Policy and Science Considerations, (2006), Martinus Nijhoff Publishers.
3. Manahan, S.E.Environmental Chemistry. CRC Press (2010), Taylor and Francis Group.
4. Dey.A.K.Environmental Chemistry, V Ed., New Age International Publishers,(2005).
5. Maslin, M.Climate Change: A Very Short Introduction. Oxford Publications, (2014).
6. Mathez, E.A. Climate Change: The Science of Global Warming and our Energy Future. Columbia University Press,(2009).
7. Mitra, A.P., Sharma, S., Bhattacharya, S., Garg, A., Devotta, S. &Sen, K. 2004. Climate Change and India. Universities Press, India.
8. Adaptation and mitigation of climate change-Scientific Technical Analysis. Cambridge

University Press,
Cambridge,2006.
9. John Houghton, Global Warming: The Complete Briefing, 5th Edition, 2015, Cambridge Univ. Press.

E-CONTENT

1. https://www.metoffice.gov.uk/weather/climate/science/the-science-behind-climatechange
2. https://www.rmets.org/resource/what-climate-change
3. https://climate.nasa.gov/
4. https://earthobservatory.nasa.gov/
5. https://scied.ucar.edu/learning-zone/climate
6. https://www.noaa.gov/education/resource-collections/climate
7. https://www.globalchange.gov/browse/educators
8. https://unfccc.int/

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, U 2003
3. Trivedi R.K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, Ind 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.

0. G.K.Ghosh, Disaster Management, A.P.H.Publishers, New Delhi, 2006.

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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 13. http://www.faadooengineers.com/threads/7894-Environmental-Science

CODE	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

CODE	SUB NAME	L	T	P	C
XAR 704 B	DISASTER RESISTANCE 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.				

SUBCODE	**SUB NAME**	**L**	**T**	**P**	**C**
XAR704	**LANDSCAPE DESIGN**	**2**	**0**	**1**	**3**
C:P:A	**1.2:1.8:0**	**L**	**T**	**P**	**H**
		2	**0**	**1**	**4**
UNIT – I	**INTRODUCTION**				**10**
	Introduction to Landscape, Categories and Materials in Landscape, Objective and Professional Scope of Landscape. Basic concepts of ecology and the impact of human activities on them. Bio, Geo, chemical cycles including water cycle, carrying capacity of an ecosystem. Environmental impact assessment. Reclamation and restoration of derelict lands.				
UNIT – II	**ELEMENTS IN LANDSCAPE DESIGN**				**13**
	Introduction to hard and soft landscape elements. Different types of hard landscape elements. Plant materials, Plants as design elements- classification structural characteristic of plants – visual characteristics of plant viz. line, form, texture, colour, etc. – basic data for plant selection. water and landform - classification, characteristics, use and application in landscape design.				
UNIT – III	**GARDENS**				**10**
	Catagories of garden, Indian, Japan, Spanish, Chinese, English French, Italian, Mugal Garden (TajMahal) Japanese gardens: Italian Renaissance gardens, Outline of landscape and garden design in Indian history. Gardens depicted in Sanskrit literature, Nandavanams and residential gardens of South India. Mughul gardens. Public parks and residential gardens of the colonial period. Contemporary public landscape projects. Study of notable				

	examples. Spatial development in landscape design.	
UNIT – IV	**PLANTING DESIGN**	**15**
	Behavioral principles, landform design, Landscape character – Landscape Composition – Plant Association– Landscape effects-Organisation of spaces- circulation, built form and open spaces- exercises on planning for neighbourhood parks and campus developments..	
UNIT – V	**LANDSCAPE DESIGN OF FUNCTIONAL AREAS / /PUBLIC OPEN SPACES**	**12**
	Urban open spaces and principle of urban landscape. Street landscaping, landscape design for waterfront areas and functional areas in urban centres like squares, plazas . Green infrastructure including green roofs and walls Landscaping for residential layout – ecreational facilities, like parks, play fields- water front areas – hill areas , Consideration and key factors to landscaping of above context. **Design Assignment**: landscape proposal and Drawing preparation for assigned projects.	

LECTURE	**TUTORIAL**	**PRACTICAL**	**TOTAL**
40	**0**	**20**	**60**

TEXT

1. Landscape Architecture – John Omsbeesimonds .
2. Planting Design – Theodore D Walker.
3. Motloch, J.L., 'An Introduction to Landscape Design', US: John Wiley and Sons, 2001.
4. Michael Laurie, 'Introduction to Landscape Architecture', Elsevier, 1986.
5. Sauter D; 'Landscape Construction', Delmar Publishers; 2000.
6. Geoffrey And Susan Jellico, 'The Landscape of Man', Thames And Hudson, 1987

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 904A	ARCHITECTURAL CONSERVATION	2	0	1	3
C:P:A =	0.6:1.2:1.2	L	T	P	H
		2	0	1	4

UNIT – I	INTRODUCTION TO CONSERVATION	10
	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	10
	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	10
	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	20
	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. Exercise on Documentation & conservation proposals for a heritage / historic / monumental building.	
UNIT – V	CONSERVATION PLANNING	10
	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 managemen	

LECTURE	TUTORIAL	PRACTICAL	TOTAL
30	0	30	60

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

SUBCODE	SUB NAME`	L	T	P	C
XAR 901	PROFESSIONAL PRACTICE AND ETHICS	2	0	0	2
C:P:A	2:0:0	L	T	P	H
		2	0	0	2

UNIT – I ARCHITECT AND PROFESSION **6**

Role of architect in society - role of IIA and COA– Salient features of Architects' Act 1972 - code of conduct, Partial/ Comprehensive Architectural service, Conditions of engagement of an architect - normal additional, special and partial services. Architect’s Registration Act. importance of ethics in professional practice (Council of Architecture guide lines) - Code of Professional Conduct for architects as prescribed by Council of Architecture, punitive action for professional misconduct of an architect.
Office set up and administration, Filling and recording of letters and drawings. Nature of partnership, registration of firm and dissolution. Practice Procedure and conduct, membership of professional organization. Entrepreneurship aspects of architectural profession. Work order agreement. (Council of Architecture norms) - Mode of payment - Terms and conditions of engagement.
- relationship with client and contractor – management of an architect's office - elementary accountancy. Tax liabilities. Copy-rights of drawings

UNIT – II ARCHITECTURAL COMPETITIONS **5**

Types of competitions - appointment of assessors - duties of assessors - instructions to participants - rejection of entries - award of premium - guidelines prescribed by COA & IIA for promotion and conduct of competitions. Code relation to Architectural Competition.

UNIT – III TENDER and CONTRACT **6**

Tenders. Types of tenders and tenders document, tender draft notices and invitation of tenders. Procedure for opening and selection of tenders. Analysis and report to owner.
Work order.-Contract.
Type of contracts and contract documents, detailed knowledge about various conditions of contract as published by the Indian Institute of Architects and specially about :
Earnest Money. Security Deposit, Retention Money. Mobilization Fund. Bank Guarantee.
Architect’s Instructions. Clerk of works. Variation and extras. Defects after completion.
Certificates and payments. Insurance and fire Insurance. Liquidate damage. Termination of the contrac

UNIT – IV ARBITRATION & EASEMENTS **6**

Arbitration clause. Arbitration, Conciliation and Mediation. Arbitration proceedings and Awards. Duties and liabilities in profession. Legal responsibility of architect to Employer.
Easements -Definition - types of easement – acquisition extinction and protection of easements - Arbitration in disputes - arbitration agreement - sole arbitration - umpire - accepted matters and – award.

UNIT – V BUILDING RULES and LEGISLATION	7

The Building Rules and By laws - Panchayat , Municipal Corporation, Role of Local Authorities and Local Planning Authorities- Development Control Rules – Chennai Metropolitan Development Authority. Environmental Acts and Laws, Fire Safety Rules – Role of EIA Committee Need for special rules on architectural control and development -Special Rules governing Hill Area Development - coastal area development - Heritage Act of India - Role of urban Arts Commission, Tamil Nadu Factory Rules. Consumer Protection Act 1986.

	LECTURE	TUTORIAL	PRACTICAL	TOTAL
	30	0	0	30

TEXT

1. Publications of COA IIA Hand book on Professional Practice, The Architects publishing Corporation of India, and Bombay 1987
2. Roshan Namavathi, Professional Practice, Lakhsmi Book Depot, Mumbai, 1984.
3. Vasant S. Apte., Architectural Practice and Procedure, Padmaja bhide publisher, Pune 2008.

REFERENCES

1. J.J. Scott, Architect's Practice, Butterworth, London 1985

2 D.C. Rules for Chennai Metropolitan Area 1990

3. T.N.D.M. Building Rules, 1972

4. T.N.P. Building Rules 1942

5. Chennai City Corporation Building Rules 1972

6. Derek Sharp, The Business of Architectural Practice William Collins Sons &Co. Ltd., Erafton St., London W1 1986

7. The Tamil Nadu Hill Areas Special Building Rules - 1981

8. Environmental Laws of India - by Kishore Vanguri, C.P.R. Environmental

Education Centre, Chennai

SUBCODE	SUB NAME	L	T	P	C
XAR904B	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 – IIPLANTING 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 – IIIELEMENTS IN LANDSCAPE DESIGN **10**

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

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

principles 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.

XAR 904C - BEHAVIORAL STUDIES IN BUILT ENVIRONMENT 3 – 0 – 0 – 3

COURSE OBJECTIVES:

1. To make the students to understand concepts and concerns of perception.
2. To create awareness about built - environment and perception.

SUBCODE	SUB NAME	L	T	P	C
XAR 904C	BEHAVIORAL STUDIES IN BUILT ENVIRONMENT	3	0	0	3
C:P:A = 1.2:1.2:0.6					
		L	T	P	H
		3	0	0	3

UNIT – I CONCEPTS AND CONCERNS OF PERCEPTION	**7**
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	**5**
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	**5**
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.

SYLLABUS - M.Arch

YAR102 APPROPRIATE MATERIALS AND 3 0 0 3

TECHNOLOGY FOR SUSTAINABLE ARCHITECTURE

UNIT I - INTRODUCTION 6 Architecture and the survival of the planet- Assessing patterns of consumption and their alternatives- Profit and politics- Natural building movement – new context for codes and regulations.
UNIT II - DESIGN PRINCIPLES **12** 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 6 Design issues relating to sustainable development including site and ecology, community and culture, health, materials, energy, and water- Domestic and Community buildings using self help techniques of construction; adaptation, repair and management.-.portable architecture.
UNIT IV - SYSTEMS MATERIALS AND APPLICATIONS 12 Adobe- Cob- Rammed Earth- Modular contained earth- light clay- Straw bale- bamboo- earthen finishes, etc.- their sustainability; adaptability to climate; engineering considerations, and construction methods; Waste as a resource Portable architecture to Applications through specific case studies.
UNIT V- CASE STUDIES FROM THE CONTEMPORARY SCENARIO 9 Ranging from small dwellings to large commercial buildings, drawn from a range of countries to demonstrate best current practice.**Total: 45 Hours**
REFERENCES 1. Brenda and Robert Vale; Green Architecture: Design for a sustainable future; Thames and Hudsson;1996 2. Lynne Elizabeth and Cassandra Adams; Alternative Construction: Contemporary Natural Building Methods 3. Victor Papanek; The Green Imperative; Thames and Hudson; 1995 4. Steven Harris and Deborah Berke; Architecture of the Everyday; Princeton Architectural Press; 1997 **5.** Pilar Echavarria; Portable Architecture- and unpredictable surroundings; Page One Publishing Pvt. Ltd.; 2005

YAR103 – ADVANCED STUDIES IN REGIONAL AND VERNACULAR ARCHITECTURE **3 – 0 – 0 – 3**

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**
Brief introduction to vernacular architecture in global context – concepts and approaches in the study of vernacular architecture.	
UNIT – II VERNACULAR ARCHITECTURE IN 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 analyzing 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 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, Havali- 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 LANDSCAPE DESIGN 3 0 0 3

UNIT I - ECOLOGY AND LANDSCAPE 6 Concept of Ecosystem: General Structure and Function - Energy flow, Primary & Secondary Production - Types of Biogeochemical cycles; Carbon cycle, Global water cycles, nitrogen cycle bioaccumulation and biomagnifications and - Analysis and evaluation. Concept of ecosystem services.- Types of Ecosystems Environmental Impact Assessment 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.
UNIT II - PLANTS AND DESIGN 10 Basic plant structure/morphology/anatomy - Basic plant functions/growth & development / physiology - Principles of taxonomy / classification, identification and naming Familiarity with local flora. Ecological and Botanical considerations in landscape design. Plant data sheet.Planting as a design element for structuring the landscape.Structural and visual characteristics of plants.Principles of visual composition.Plant association. The role of plant material in environmental improvement, (e.g. soil conservation, modification of microclimate).
UNIT III - CULTURAL AND HISTORIC LANDSCAPE 10 Early traditions and beliefs about landscape and environment in 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 – impact of China on Japanese gardens – Japanese gardens.Nomadic culture of central Asia – advent of Islam – 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 Industrialization and urbanization – impacts and development of the concept of public open spaces, open space development in new towns, parks movement.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 Issues in contemporary India, Analysis and understanding of philosophies of Contemporary landscape works in India, case studies. **Total: 45 Hours**

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.

8. PieluigiNicholin, Francesco Repishti, Dictionary of today's landscape desig, SkiraEditores P.A, 2003.

YAR 302 HERITAGE CONSERVATION PLANNING 3 0 0 3

UNIT – I INTRODUCTION TO ARCHITECTURAL CONSERVATION 6

Introduction to architectural conservation of heritage buildings, environmental conservation, purpose & scope of conservation projects in Indian context – Role of architect in such programmes, values & ethics of conservation programme- involvement of community & social organisations – public participation – conflict and compatibility between conservation and development.

UNIT – II PROCEDURE FOR CONSERVATION 10

Procedure for 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 & columns, foundation etc, causes of decay in buildings by natural and human factors, The role of conservation architect & his team.

UNIT – III STRUCTURAL CONSERVATION 10

Behavioral properties of traditional construction materials- various methods and techniques involved in structural conservation, case studies and examples.

UNIT – IV LEGISLATION AND INSTITUTIONS 11

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 CASESTUDIES 8

Case studies of conservation projects in Indian and International context. Appraisal of conservation project in view of the above issues- success & failure – reasons for it.**Total: 45 Hours**

REFERENCES

1. Conservation and development in historic towns & cities – Pamela Ward Press Ltd.
2. Planning for conservation – Kain Roger – St.Martin N-Y 1981.
3. Character of towns – An approach to conservation – Worskett Roy, Arch. Press – London.
4. Guidelines for conservation by INTACH.
5. Conservation of Historic Buildings, Sir Bernard M. Felidan, - Arch Press, 1982.
6. Gerald Glenn, "Presentation & Rehabilitation" (1996), ASTM International.
7. History of Architectural conservation, (1st Pub 1999, Reprint 2005) – Butterworth, Oxford, UK.

YAR 303 URBAN DESIGN PRACTICES 3 0 0 3

UNIT I INTRODUCTION TO URBAN DESIGN THEORY 10

City as a three – dimensional entity, study of volumes & open spaces, a brief Historic review of the development of the urban design discipline and principles.Historic developments of streets and squares

UNIT II ELEMENTS OF URBAN DESIGN 10

Urban form as determined by the inter-play of masses, voids, building typology, scale, harmony, symmetry, colour, texture, light & shade, dominance, height, urban signage & graphics, organization of spaces & their articulation in the form of squares, streets, vistas & focal points, image of the city & its components.

UNIT III URBAN DESIGN METHODOLOGIES 10

Methods of urban design surveys, documentation and representation.Cognitive mapping – contemporary and traditional, architectural expressions.Seminar presentation on transport planning in urban design.

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

Legal & administrative aspects, policies, charters, case studies of proposals for urban design projects

from India & Abroad **Total: 45 Hours**

REFERENCES

1. Jon Lang, "Urban design" – a typology pf procedures & products 2005, Glsevier, North America.8
2. Gcoffrey Broadbent, "Emerging concepts in Urban Space Design-(1995), Jayker& ravels.
3. Cliff Monghtin, "UD-Street &Squace," (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.

YAR 304B ENERGY SIMULATION AND MODELLING 2 -2 - 0- 3

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, 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 tilted surface; Sunpath 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 MODELING 10

Definition of energy modeling, Answers that energy modeling provide, 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.

Total: 60 Hours

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.
rnational Energy Conservation Code 2003, International Code Council.
er, Nick, Energy And Environment In Architecture, Taylor & Francis, 2000.
belsteen, Andy van den, Smart Building In A Changing Climate, Island Press, 2009.

COURSE CODE	XUM106 / XUM607 / XUM506	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

HSMC (H-102)	**Universal Human Values 2: Understanding Harmony**	**L**	**T**	**P**	**C**
		2	1	0	3
		L	**T**	**P**	**H**
		2	1	0	3
Pre-requisites (if any)	**None. Universal Human Values-I (Desirable)**				
C:P:A= 3:0:0					

S. No	**COURSE OUTCOMES**	**DOMAIN**	**LEVEL**
CO1	***Explore*** about the need of value education.	Cognitive	Understand
CO2	***Interpret*** self and body needs and responses to ensure harmony within self.	Cognitive	Understand
CO3	***Explore*** the harmony in the family and society	Cognitive	Understand
CO4	***Explore*** about the harmony in the nature / existence	Cognitive	Understand

CO5	***Discuss*** about the holistic understanding.	Cognitive	Understand

Module 1 **– Introduction to Value Education (6 lectures and 3 tutorials for practice session)**

Lecture1: Understanding Value Education
Lecture2: Self-exploration as the Process for Value Education
Tutorial 1: Practice Session *PS1* *Sharing about Oneself*
Lecture3: Continuous Happiness and Prosperity– the Basic Human Aspirations
Lecture 4: Right Understanding, Relationship and Physical Facility
Tutorial 2: PracticeSessionPS*2* *Exploring Human Consciousness*
Lecture 5: Happiness and Prosperity– Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS*3* *Exploring Natural Acceptance*

Module 2 **– Harmony in the Human Being (6 lectures and 3 tutorials for practice session)**

Lecture7: Understanding Human being as the Co-existence of the Self and the Body
Lecture8: Distinguishing between the Needs of the Self and the Body
Tutorial 4: Practice Session PS*4* *Exploring the difference of Needs of Self and Body*
Lecture9: The Body as an Instrument of the Self
Lecture10: Understanding Harmony in the Self
Tutorial 5: Practice Session PS*5* *Exploring Sources of Imagination in the Self*
Lecture11: Harmony of the Self with the Body
Lecture12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS*6* *Exploring Harmony of Self with the Body*

Module 3 **– Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)**

Lecture13: Harmony in the Family –the Basic Unit of Human Interaction
Lecture14: Values in Human-to-Human Relationship
Lecture 15: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS *7* *Exploring the Feeling of Trust*
Lecture16: 'Respect'–as the Right Evaluation
Tutorial 8: Practice Session PS *8* *Exploring the Feeling of Respect*
Lecture17: Understanding Harmony in the Society
Lecture18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS *9* *Exploring Systems to fulfill Human Goal*

Module 4 **– Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)**

Lecture19: Understanding Harmony in the Nature
Lecture20: Interconnectedness, self-regulation and Mutual Fulfillment among the

Four Orders of Nature

Tutorial 10: Practice Session PS*10 Exploring the Four Orders of Nature*

Lecture21: Realizing Existence as Co-existence at All Levels

Lecture22: The Holistic Perception of Harmony in Existence

Tutorial11: Practice Session PS *11Exploring Co-existence in Existence*

Module 5 – **Implications of the Holistic Understanding – a Look at Professional Ethics (6lectures and 3 tutorials for practice session)**

Lecture23: Natural Acceptance of Human Values

Lecture24: Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS *12 Exploring Ethical Human Conduct*

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture26: Competence in Professional Ethics

Tutorial 13: Practice Session PS*13 Exploring Humanistic Models in Education*

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture28: Strategies for Transition towards Value-based Life and Profession

Tutorial 14: Practice Session PS *14 Exploring Steps of Transition towards Universal Human Order*

READINGS:

Text Book and Teachers Manual

a. The Textbook

A Foundation Course in Human Values and Professional Ethics, R R Gaur, RAsthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN978-93-87034-47-1

b. The Teacher's Manual

Teachers' Manual for *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, NewDelhi, 2019.ISBN978-93-87034-53-2

Reference Books

1. Jeevan Vidya:EkParichaya, A Nagaraj, Jeevan VidyaPrakashan,Amarkantak,1999.
2. HumanValues, A.N. Tripathi, NewAge Intl.Publishers, NewDelhi,2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth-by Mohandas Karam chand Gandhi
5. Small is Beautiful -E. F Schumacher.
6. Slow is Beautiful-Cecile Andrews
7. Economy of Permanence-JC Kumarappa
8. Bharat Mein Angreji Raj –Pandit Sunderlal
9. Rediscovering India- by Dharampal
10. Hind Swarajor Indian Home Rule-by Mohandas K.Gandhi

11. India Wins Freedom-Maulana Abdul Kalam Azad
12. Vivekananda-Romain Rolland (English)
13. Gandhi-Romain Rolland(English)

Table 1: HSMC (H-102) - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	0	0	0	0	0	0	0
PO_2	2	0	0	0	0	2	1
PO_3	1	0	0	0	0	1	1
PO_4	0	0	0	0	0	0	0
PO_5	0	0	0	0	0	0	0
PO_6	2	2	2	2	2	10	2
PO_7	2	2	2	2	2	10	2
PO_8	3	3	3	3	3	15	3
PO_9	0	0	0	0	0	0	0
PO_{10}	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0
PO_{12}	2	2	2	2	2	10	2
PSO_1	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	0	0

1-5 → 1, 6-10 → 2, 11-15 → 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 are 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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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

Semester	**VII**		
Subject Name	**CYBER SECURITY**		
Subject Code	**XUM706 / XUM801/ XUM701**		
L –T –P –C **0- 0 – 0- 0**		**C:P:A** **3:0:0**	**L –T –P –H** **3- 0 – 0- 3**

Course Outcome:		**Domain C or P or A**
CO1	Able to understand the Cyber Security Policy, Laws and Regulations	C (Remember)
CO2	Able to discuss the Cyber Security Management Concepts	C (Understand)
CO3	Able to understand *t*he Cyber Crime and Cyber welfare	C (Understand)
CO4	Able to discuss on issues related to Information Security Concepts	C (Understand)
CO5	Able to understand various security threats	C (Understand)

COURSE CONTENT

UNIT I INTRODUCTION	**9 hrs**
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 II CYBER SECURITY OBJECTIVES AND GUIDANCE	**9 hrs**
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 III CYBER SECURITY POLICY CATALOG	**9hrs**
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 IV SECURITY SYSTEMS	**9hrs**
Information Security Overview: Background and Current Scenario - Types of Attacks - Goals for Security - E-commerce Security - Computer Forensics – Steganography	
UNIT V LEGAL ETHICS	**9hrs**
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	
	L- 45 hrs Total – 45 hrs

TEXT BOOKS

1. Nina Godbole, "Information Systems Security: Security Management, Metrics, Frameworks

and Best Practices, w/cd", Wiley Publications, 2008, ISBN 10: 8126516925, ISBN 13 :9788126516926
2. Thomas J. Mowbray, "Cyber security: Managing Systems, Conducting Testing and Investigating Intrusions", Wiley Publications, 2013, Kindle Edition, ISBN 10: 812654919X, ISBN 13 :9788126549191
3. D.S. Yadav, "Foundations of Information Technology", New Age International publishers, 3rd Edition, 2006, ISBN-10: 8122417620, ISBN-13: 978-8122417623

REFERENCES

1. Mike Shema, "Anti-Hacker Tool Kit", McGraw Hill Education, 4th edition, 2014,
2. Nina Godbole, SunitBelapure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wileypublilcations, 2013, ISBN 10 : 8126521791, ISBN 13:9788126521791.
3. Corey Schou, Daniel Shoemaker, "Information Assurance for the Enterprise: A Roadmap to Information Security (McGraw-Hill Information Assurance & Security)", Tata McGraw Hill, 2013, ISBN-10: 0072255242, ISBN-13: 978-0072255249.
4. VivekSood, "Cyber Laws Simplified", McGraw Hill Education (INDIA) Private Limited in 2001, ISBN-10: 0070435065, ISBN-13: 978-0070435063.Steven M.Furnell, "Computer Insecurity", Springer Publisher, 2005 Edition.

E-REFERENCES

1. https://www.cryptool.org/en/
2. https://www.metasploit.com/
3. http://sectools.org/tool/hydra/
4. http://www.hping.org/
5. http://www.winpcap.org/windump/install/
6. http://www.tcpdump.org/
7. https://www.wireshark.org/
8. https://ettercap.github.io/ettercap/
9. https://www.concise-courses.com/hacking-tools/top-ten/
10. https://www.cirt.net/Nikto2
11. http://sqlmap.org/

Mapping of COs with GAs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	3	2	0	2	0	0	1	0	0	0	0	0	0	0
CO2	3	2	3	2	3	2	2	0	2	0	2	2	1	0
CO3	3	2	3	2	3	2	2	0	2	0	2	2	1	0
CO4	3	2	3	2	3	2	2	0	2	0	2	2	1	0
CO5	2	2	0	2	0	0	1	0	0	0	0	0	0	0
CO6	1	2	0	3	0	2	2	2	2	0	2	2	0	0
	15	12	9	13	9	8	10	2	8	0	8	8	3	0

1 - Low, 2 – Medium, 3 – High

Subject Code			XUM306	L	T	P	C	
Subject Name			Entrepreneurship Development	2	0	0	2	
C	P	A		L	T	P	SS	H
2.7	0	0.3		2	0	0	1	3
Prerequisite			NIL					

Course Objectives
Through this course the students will

- Understand the Entrepreneurial motivation and inclination
- Idea about the market assessment
- To get familiar in government policies and global opportunities for Entrepreneurship Development

Course Outcome:		Domain	Level	
CO1	***Recognise*** and ***describe*** the role of innovation and motivation for an entrepreneur.	Cognitive	K2	Understand
CO2	***Self-assess*** and ***appraise*** your entrepreneurship interest with your chosen entrepreneur.	Cognitive	K2	Understand
CO3	***Outline*** the importance of generation of new ideas for entrepreneurship and ***illustrate*** market assessment.	Cognitive	K2	Understand
CO4	***Explain*** the competition in business and ***sketch/demonstrate/comply*** business model for dealing with competition.	Cognitive/	K2	Understand
			K3	Apply
		Affective	A3	Value
			A2	Response
CO5	***Describe*** and ***Explain*** venture creation and launching of small business and its management.	Cognitive	K1	Remember
			K2	Understand
CO6	***Describe*** and ***Discuss*** various government policies and global opportunities for Entrepreneurship Development	Cognitive/	K1	Remember
			K2	Understand

COURSE CONTENT

UNIT-I	**INNOVATION AND ENTREPRENEURSHIP**	**5**
	Definition of Innovation, Creativity and Entrepreneurship; role of innovation in entrepreneurship development - Entrepreneurial motivation - Competencies and traits of an entrepreneur -Role of Family and Society; Entrepreneurship as a career and its role in national development	
UNIT –II	**SELF ASSESSMENT OF ENTREPRENEURIAL INCLININATION**	**4**
	Self-assessment of entrepreneurial inclination -Presentation by students on their entrepreneurial inclination rating -Case study of successful entrepreneurs	
UNIT-III	**NEW IDEA GENERATION TO MARKET ASSESSMENT**	**9**
	Importance of Idea generation-filtering-refinement - opportunity recognition - Description of chosen idea - value proposition, customer-problem-Solution statement -benefits; development	

	status; IP ownership -Market Validation- Technology/ user/decision makers/ partners -market need; segmentation -market TAM,SAM and SOM -case study on market segmentation by popular companies	
UNIT –IV	**CUSTOMER – COMPETITION- BUSINESS MODEL**	**9**
	Customer-Target primary customer research, Decision making unit/ process-Beach head market; Cost of Customer Acquisition - Competition- comparative analysis, competitive advantages-; -Business model -Financial planning -Pitch documentation and presentation	
UNIT – V	**VENTURE CREATION AND LAUNCHING OF SMALL BUSINESS AND ITS MANAGEMENT**	**9**
	New enterprise creation - organizational and legal matters -Operational plan -Sales and distribution plan - Accounting -Team recruitment and management -Fund raising and management -Profile of a startup – case studies	
UNIT– VI	**GOVERNMENT INITIATIVES AND GLOBAL OPPORTUNITIES**	**9**
	Incubators and accelerators - capacity building -Startup policies- Startup India-Support for MSME; GeM Portal. Funding–national and international sources-Bilateral programmes by Govt. of India -Global reach for promoting cross-cultural entrepreneurship (1)	

L	**T**	**P**	**SS**	**Total**
30	---	---	**15**	**45**

REFERENCE BOOKS

1. A.P.Aruna, " Lecture Notes on Entrepreneurship Development", available as softcopy @ www.brain.net
2. Thomas W. Zimmerer, Norman M. Scarborough, "Essentials of Entrepreneurship and Small Business Management", Pearson; 3rd edition, 2001.
3. John Burnett, "Introducing Marketing", Open Text Book available at http://solr.bccampus.ca:8001/bcc/file/ddbe3343-9796-4801-a0cb-7af7b02e3191/1/Core%20Concepts%20of%20Marketing.pdf
4. Toubia, Olivier. "Idea Generation, Creativity, and Incentives", Marketing Science. Vol. 25. pp.411-425. 10.1287/mksc.1050.0166, 2006.
5. Alexander Osterwalder and Yves Pigneur, "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers",Wiley; 1st edition, 2010.
6. Gerardus Blokdyk,"3C's model The Ultimate Step-By-Step Guide"5starcooks, 2018.

Subject Code			XUM307	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 fulfillment. 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 people friendly 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 VidyaEk- 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)

Course Code			**:**	**XUM406**	**L**	**T**	**P**	**C**
Course Name			**:**	**DISASTER MANAGEMENT**	**0**	**0**	**0**	**0**
Prerequisite			**:**	**NIL**	**L**	**T**	**P**	**H**
C	**P**	**A**			**3**	**0**	**0**	**3**
3	**0**	**0**						

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Understand the concepts of disasters, their significance and types	Cognitive	Understand
CO2	Understand the relationship between vulnerability, disasters, disaster prevention and risk reduction	Cognitive	Understand
CO3	Able to understanding of preliminary approaches of Disaster Risk Reduction (DRR)	Cognitive	Understand
CO4	Develop awareness of institutional processes in the country	Cognitive	Application
CO5	Develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity	Cognitive	Application

COURSE CONTENT

UNIT I	**INTRODUCTION TO DISASTERS**	**6**
	Importance &Significance, Types of Disasters, Climate Change, DM cycle	
UNIT II	**RISK ASSESSMENT**	**12**
	Risk, Vulnerability, Types of Risk, Risk identification, Emerging Risks, Risk Assessment, Damage Assessment, Risk modeling.	
UNIT III	**DISASTER MANAGEMENT**	**10**
	Phases, Cycle of Disaster Management, Institutional Framework, Incident Command System, DM Plan, Community Based DM, Community health and safety, Early Warning and Disaster Monitoring, Disaster Communication, Role of GIS and Remote Sensing, Do's and Don'ts in various disasters.	
UNIT IV	**DISASTER RISK MANAGEMENT IN INDIA**	**10**
	Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness), Disaster Management Act and Policy – Other related policies, plans, programmes and legislation	
UNIT V	**DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES**	**7**

	Landslide Hazard Zonation, Earthquake Vulnerability Assessment of Buildings and Infrastructure, Drought Assessment, Coastal Flooding, Forest Fire, Man Made disasters, Space Based Inputs for Disaster Mitigation and Management, Cast Study					
			L	**T**	**P**	**Total**
			45	**0**	**0**	**45**

TEXT BOOKS

1. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361)
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010

REFERENCE BOOKS

1. Siddhartha Gautam and K Leelakrisha Rao, "Disaster Management Programmes and Policies", Vista International Pub House, 2012
2. Arun Kumar, "Global Disaster Management", SBS Publishers, 2008
3. PardeepSahni, AlkaDhameja and Uma medury, "Disaster mitigation: Experiences and reflections", PHI, 2000
4. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
5. Government of India, National Disaster Management Policy, 2009

E-REFERENCES

- NIDM Publications at http://nidm.gov.in- Official Website of National Institute of Disaster Management (NIDM), Ministry of Home Affairs, Government of India
- http://cwc.gov.in , http://ekdrm.net , http://www.emdat.be , http://www.nws.noaa.gov , http://pubs.usgs.gov , http://nidm.gov.ini http://www.imd.gov.ini

XBTOE1			INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
				3	0	0	3
C	P	A		L	T	P	H
3	0	0					
				3	0	0	3

Prerequiste : Nil

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 **i*nfer*** 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/

XBTOE2			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.

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**

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 **1**

DISASTER RISK REDUCTION (DRR)

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	**CONSTITUTION OF INDIA**
Subject Code	**XUM505**
Prerequisite	**Nil**

L	T	P	C
2	0	0	2

C	P	A
2	0	0

L	T	P	H
2	0	0	2

COURSE OUTCOMES

		DOMAIN	LEVEL
CO1	Understand the salient features of Indian Constitution	Cognitive	Understanding
CO2	Gather the information on the contours of Constituitional Rights and Duties	Cognitive	Understanding
CO3	know the functions and powers of Governance	Cognitive	Remembering
CO4	Summarise the Responsibilities of Local administration	Cognitive	Remembering
CO5	Able to understand the Function of Election Commission	Cognitive	Understanding

COURSE CONTENT

UNIT I HISTORY AND PHIOLOSOPHY 9 Hrs

History of Making of the Indian Constitution: History-Drafting Committee, (Composition& Working)Philosophy of the Indian Constitution: Preamble-Salient Features

UNIT II CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES 9 Hrs.

Fundamental Rights -Right to Equality-Right to Freedom-Right against Exploitation-Right to Freedom of Religion-Cultural and Educational Rights-Right to Constitutional Remedies-Directive Principles of State Policy-Fundamental Duties.

UNIT III ORGANS OF GOVERNANCE 7 Hrs

Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive-President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications-Powers and Functions

UNIT IV **LOCAL ADMINISTRATION** **11 Hrs**

District's Administration head: Role and Importance, -Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V **ELECTION COMMISSION** **9 Hrs**

Election Commission: Role and Functioning. -Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Lecture	Tutorial	Practical	Total
30	---	---	30

Text Books

1. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

References

1. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
2. The Constitution of India, 1950 (Bare Act), Government Publication.

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

Semester	**I**
Subject Name	**XGS105**
Subject Code	**SPEECH COMMUNICATION**

L –T –P –C	**C:P:A**	**L –T –P –H**
0- 1 – 2– 3	**2.6:0.4:0**	**0- 1– 4 – 5**

Course Outcome		**Domain/Level C or P or A**
CO1	***Ability*** to recall the types of speeches	**K1**
CO2	***Apply*** the techniques in public speaking	**K3**
CO3	***Identify*** the common patterns in organizing a speech	**K1**
CO4	***Construct*** the nature and style of speaking	**K6**
CO5	***Practicing*** the speaking skills	**P3**
CO6	***Apply*** the techniques everyday life	**K3**

COURSE CONTENT

UNIT I	**Types of Speeches**	**9 HRS**
	1.1 – Four types of speeches 1.2 – Analyzing the audience 1.3 - Developing ideas and supporting materials	
UNIT II	**Public Speaking**	**9 HRS**
	2.1 - Introduction to Public Speaking 2.2 - Competencies Needed for successful speech making 2.3 – Speaking about everyday life situations	
UNIT III	**Organization of Speech**	**9 HRS**
	3.1 – Developing a speech out line 3.2 - Organizing the speech 3.3 – Introduction - development – conclusion	
UNIT IV	**Presentation**	**9 HRS**
	4.1 - Tips for preparing the draft speech 4.2 – Presentation techniques using ICT tools 4.3 – Using examples from different sources	
UNIT V	**Activities**	**9 HRS**
	5.1 – Reading activities 5.2 – Creative presentations 5.3 – Media presentation techniques	

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

Suggested Readings:

(i) Michael Swan. *Practical English Usage.* OUP. 1995
(ii) Sanjay Kumar and Pushp Lata. *Communication Skills*. Oxford University Press. 2011

Semester	**II**
Subject Name	**XGS204**
Subject Code	**TECHNICAL COMMUNICATION**

L –T –P –C	C:P:A	L –T –P –H
2- 0 – 0– 2	**3:0:0**	**2- 0– 0 – 2**

Course Outcome		**Domain/Level C or P or A**
CO1	***Ability*** to understand the basic principles	**K1**
CO2	***Apply*** the techniques in writing	**K3**
CO3	***Identify*** communicative styles	**K1**
CO4	***Construct*** the nature of writing	**K6**
CO5	***Ability*** to recall the Techniques	**K1**
CO6	***Apply*** the techniques in practice	**K3**

COURSE CONTENT

UNIT I	**Basic Principles**	**9 HRS**
	1.1 – Basic Principles of Technical Writing 1.2 – Styles used in Technical Writing 1.3 – Language and Tone	
UNIT II	**Techniques**	**9 HRS**
	2.1 – Special Techniques used in writing 2.2 – Definition & Description of mechanism 2.3 – Description- Classification-Interpretation	
UNIT III	**Communication**	**9 HRS**
	3.1 – Modern development in style of writing 3.2 - New letter writing formats	
UNIT IV	**Report Writing**	**9 HRS**
	4.1 – Types of Report writing 4.2 – Project writing formats	

Suggested Readings:

(i) John Sealy, Writing and Speaking Author; Oxford University Press, New Delhi, 2009

(ii) Williams K.S, Communicating Business. Engage Learning India Pvt Ltd, 2012

Semester	**IV**
Subject Name	**Economics for Engineers**
Subject Code	**XUM405/XUM601/XUM009**

L –T –P –C	**C:P:A**	**L –T –P –H**
3 - 0 – 0– 3	**2.64:0.24:0.12**	**3- 0– 0 – 3**

Course Outcome		**Domain/Level C or P or A**
CO1	***Explain*** the concepts of economics in engineering and ***identify*** element of cost to prepare cost sheet	C(Understand) P(Perception)
CO2	***Calculate and Explain*** the Break-even point and marginal costing	C(Apply, Understand) P(Perception)
CO3	***Summarize*** and ***Use*** value engineering procedure for cost analysis	C(Understand) A(Receive)
CO4	***Estimate*** replacement problem	C(Understand)
CO5	***Compute, Explain*** and ***make Use of*** different methods of depreciation	C(Understand, Apply)

COURSE CONTENT

UNIT I	**INTRODUCTION TO ECONOMICS**	**8 hrs**
	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 hrs**
	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	**VALUE ENGINEERING &COST ACCOUNTING**	**10 hrs**
	Value engineering – Function, aims, Value engineering procedure - Make or buy decision Business operating costs, Business overhead costs, Equipment operating costs	
UNIT IV	**REPLACEMENT ANALYSIS**	**7 hrs**
	Replacement analysis –Types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset.	
UNIT V	**DEPRECIATION**	**8 hrs**
	Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the year's digits method of depreciation, sinking fund method of depreciation, Annuity method of depreciation, service output method of depreciation.	

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

TEXT BOOKS

1. Sp Gupta, Ajay Sharma & Satish Ahuja, "Cost Accounting", V K Global Publications, Faridabad, Haryana, 2012
2. S.P.Jain&Narang, "Cost accounting – Principles and Practice", Kalyani Publishers, Calcutta, 2012
3. PanneerSelvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.
4. William G.Sullivan, James A.Bontadelli& Elin M.Wicks, "Engineering Economy", Prentice Hall International, New York, 2001.

REFERENCES

1. Luke M Froeb / Brian T Mccann, " Managerial Economics – A problem solving approach" Thomson learning 2007
2. Truett&Truett, "Managerial economics- Analysis, problems & cases " Wiley India 8th edition 2004.
3. Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2002.
4. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2002

E-REFERENCES - 1. http://nptel.iitm.ac.in/video.php

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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
Total	7	10	3	9	0	0	6	6	4	8	11	15

1 - Low, 2 – Medium, 3- High

Semester	**TRACK – I**
Subject Name	**RENEWABLE ENERGY SOURCES**
Subject Code	**XMEE04**

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**

2 - 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- 2022-23 ACADEMIC YEAR

Semester	**I**	
Course Name	**Solar Energy Systems**	
Course Code	**YRE101**	
L –T –P –C **3 – 0 – 0– 3**	**C:P: A** **3:0:0**	**L –T –P –H** **3–0– 0 – 3**

CO Number	CO STATEMENT	Knowledge Level
CO1	***ntify*** proper solar radiation site	**K3**
CO2	***sign*** solar flat plate collectors	**K3**
CO3	***sign*** solar concentric collectors	**K3**
CO4	***ply*** concepts related to solar energy storage systems	**K3**
CO5	***ply*** the concepts for selection of PV systems	**K3**
CO6	***ply*** the economics concepts for PV systems	**K3**

COURSE CONTENT

UNIT I	SOLAR RADIATION	9 Hours

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 Hours

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 Hours

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 Hours

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 Hours

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.

Lecture =45 Hours **Tutorial = 0 Hours** **Total = 45 Hours**

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

REFERENCE BOOKS

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.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**3**	**3**	**2**	**2**	**3**	**2**	**3**
CO2	**3**	**3**	**2**	**2**	**3**	**2**	**3**
CO3	**3**	**3**	**2**	**2**	**3**	**2**	**3**
CO4	**3**	**3**	**2**	**2**	**3**	**2**	**3**
CO5	**3**	**3**	**2**	**2**	**3**	**2**	**3**
CO6	**3**	**3**	**2**	**2**	**3**	**2**	**3**
Tot	**18**	**18**	**12**	**12**	**18**	**12**	**18**

1 - Low, 2 – Medium, 3- High

Semester	**I**	
Course Name	**WIND, OCEAN AND GEOTHERMAL ENERGY SYSTEMS**	
Course Code	**YRE102**	
L –T –P –C **3 – 0 – 0– 3**	**C:P:A** **3:0:0**	**L –T –P –H** **3–0– 0 – 3**

CO Number	**CO STATEMENT**	**Knowledge Level**
CO1	***entify*** the wind resource assessment methods.	**K3**
CO2	***velop*** the wind flow models.	**K3**
CO3	***lect*** the optimum design for variable operations of wind turbine	**K3**
CO4	***oose*** the suitable site for the layout of wind farm.	**K3**
CO5	***entify*** the electrical and control systems for wind energy conversion.	**K3**
CO6	***tegorize*** the ocean energy systems and geothermal energy systems	**K4**

Objectives

- Understand and apply basic concepts of hydrogen energy and storage cells.
- Apply the concept of nuclear energy for power generation by optimizing the design and following safety norms.
- Understand the concept of nuclear waste management and use proper techniques for efficient management.

COURSE CONTENT

UNIT I	**WIND RESOURCE AND ASSESSMENT**	**9 Hours**
	Introduction – Modern Wind Turbines – Betz Constant, Limit - Wind Resource – Wind vs. Traditional Generation – Technology Advancements – Material Usage – Wind Energy Penetration Levels – Applications. Wind Resource Assessment – Introduction – Characteristics of Steady Wind – Weibull Wind Speed Distribution Function – Vertical Profiles of the steady Wind – Wind Rose – Energy Pattern Factor – Energy Content of the Wind Resource Assessment.	
UNIT II	**AERODYNAMICS**	**9 Hours**
	Introduction – Aerofoil – Wind Flow Models – Axial Momentum Theory – Momentum Theory for a Rotating Wake – Blade Element Theory – Strip Theory – Tip Losses – Tip Losses Correction – Drag Translator Device – Wind Machine Characteristics.	
UNIT III	**WIND TURBINE, SITING AND WIND FARM DESIGN**	**10 Hours**
	Introduction – Classification of Wind Turbines – Turbine Components – Wind Turbine Design – Rotor Torque and Power – Optimum Design for Variable Operation – Influence of Reynolds Number – Cambered Aerofoils – Load Calculation – Cost Modelling – Power Control – Braking Systems – Turbine Blade design – Rotor Hub.	

	Wind Flow Modelling – Capacity Factor – Planning of Wind Farm – Sitting of Wind Turbines – Ecological Indicators – Site Analysis – Methodology – Layout of Wind Farm – Initial Site Selection – Measure Correlate Predict (MCP) Technique – Micrositing – Wake Models.	
UNIT IV	**ECONOMICS , ELECTRICAL AND CONTROL SYSTEMS**	**9 Hours**
	Cost Calculation – Annual Energy Output (AEO) –Capital Recovery Factor – Depreciation – Life Cycle Costing – Environmental Impact - Biological Impact – Surface Water and Wetlands – Visual Impact – Sound Impact – Communication Impact. Classification of Generators – Synchronous Generators – Induction Generator – Variable Speed Generators – Control Systems – Power Collection Systems – Earthing of Wind Farms – Embedded Wind Generation.	
UNIT V	**OCEAN AND GEOTHERMAL ENERGY SYSTEMS**	**8 Hours**
	Wave energy -Tidal changes – Ecological changes – Types Tidal Power – Energy from Sea – Tidal Turbines – Tidal Power Generation - Ocean thermal energy conversion (OTEC) - construction and operational problems – history of OTEC development Alternative energy technology - Problems and solutions - Recent Trends and Developments. A compulsory seminar / assignment on design / case study/analysis /application in any one of the Wind energy, Tidal and OTEC - Geothermal energy systems.	
Lecture = 45 Hours	**Tutorial = 0 Hours**	**Total = 45 Hours**

TEXT BOOKS

1. Siraj Ahmed "Wind Energy Theory and Practice". June 2013.

2. S.N.Bhadra, D.Kastha, S.Banerjee,"Wind Electrical Systems", Oxford University,Press,2014.

3. Joshua Earnest and Tore Wizelius, "Wind Power Plants and Project Development", PHI Learning Pvt. Ltd., New Delhi, 2011.

4. J. F. Manwell, J. G. McGowan and A. L. Rogers, "Wind Energy Explained – Theory, Design and Application", Wiley, 2009.

5. E.L Wakil "Power plant technology", McGrawGill Publishers,New York

6. G. D Rai "Non Conventional Energy sources" Khanna publishers. New Delhi

REFERENCES:

1. Freris. L. L., "Wind Energy Conversion Systems", Prentice Hall 1990.

2. Earnest Joshua, "Wind Power Technology", Second edition, PHI Learning Pvt. Ltd., New Delhi, 2015.

3. Spera D. A., "Wind Turbine Technology: Fundamental Concepts of Wind Turbine Engineering", ASME Press, New York, 2009.

4. Voker Quashning, "Understanding Renewable Energy Systems", Earthscan, Second edition, 2016.

5. Tony Burton, David Sharpe, Nick Jenkins, Ervin Bossanyi, "Wind Energy Handbook" JOHN WILEY & SONS, LTD , Second Edition,2011.

6. S.Rao & B.B.Parulekar,"Energy Technology", 3rd edition,Khanna publishers,1995.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	2	3	3	3
CO2	3	3	2	2	3	3	3
CO3	3	3	2	2	3	3	3
CO4	3	3	2	2	3	3	3
CO5	3	3	2	3	2	2	3
CO6	3	3	2	2	2	2	3
Tot	18	18	12	13	16	16	18

1 - Low, 2 – Medium, 3- High

Semester	**I**
Subject Name	**SOLAR ENERGY LABORATORY**
Subject Code	**YRE106**

L –T –P –C	**C:P:A**	**L –T –P –H**
0- 0 – 2– 2	**0:1:0**	**0- 0– 2 – 4**

Course Outcome		**Domain/Level C or P or A**
CO1	***identify*** the performance of various solar collectors.	**P3**
CO2	***identify*** the performance of various solar gadgets like air dryer, cooker and solar PV panels.	**P3**
CO3	***Experiment*** the Charging characteristics of a battery using Solar PV panel and various effects on it.	**P3**
CO4	***identify*** the direct normal, global horizontal irradiance and also solar tracking accuracy using solar energy gadgets.	**P3**
CO5	***Optimize*** the flow rate for maximum heat absorption using various samples.	**P3**
CO6	***Simulate*** PV cell using Matlab / Simulink software.	**P3**

Objectives

- Study the performance of solar thermal energy applications flat plate and concentric type collectors.
- Study the performance solar photovoltaic (PV) panels at different combinations and conditions.
- Study and Optimize the performance of various Solar energy gadgets.
- Model the Solar PV cell using software.

COURSE CONTENT

CO Relation

LIST OF EXPERIMENTS		**CO**
1.	Performance evaluation of solar flat plate collector	1
2.	Performance evaluation of concentrating solar collector	1
3.	Performance evaluation of solar box cooker	2
4.	Performance evaluation air dryer	2
5.	Performance evaluation of a solar PV panel in series and parallel combination	2
6.	Charging characteristics of a battery using PV panel	3
7.	Effect of tilt angle and Effect of shadow on solar PV panel	3
8.	Solar Energy Measurements - Pyrheliometer	4
9.	Solar Energy Measurements - Pyranometer	4
10.	Parabolic Trough -Flow Rate	4
11.	External Compound Parabolic Collector (XCPC) - Oil and Water	5
12.	Mathematical modeling of photovoltaic cell/module/arrays with tags in Matlab /Simulink	6

TOTAL HOURS - 30

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,modelling and applications " Third RePrint , Narosa Publishing House, New Delhi,2006

REFERENCES

1. Edward E.Anderson, "Fundamentals for Solar Energy Conversion", Addison Wesley pub CO., 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.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	3	1	2	2	3
CO2	2	3	3	1	2	2	3
CO3	2	3	3	1	2	2	3
CO4	2	3	3	1	2	2	3
CO5	2	3	3	1	2	2	3
CO6	2	3	3	1	2	2	3
Tot	12	18	18	6	12	12	18

COURSE CODE	**COURSE NAME**	**L**	**T**	**P**	**C**
YRM107	**RESEARCH METHODOLOGY AND IPR**	**2**	**0**	**0**	**2**

After completion of the course, a student will be able to

1. Identify and formulate a research problem, collect data, identify research gap for the identified problem
2. Able to consolidate literature survey and provide inference on own words
3. Describe Patents, Designs, Trade and Copyright
4. Appraise, discuss and categorize Patent Rights
5. Identify and describe new developments in IPR

UNIT I **6**

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 II **6**

Effective literature studies approaches, analysis Plagiarism, Research ethics, 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 III **6**

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 IV **6**

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

UNIT V **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.

LECTURE	**TUTORIAL**	**TOTAL**

	30	**0**	**30**

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, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.
6. Niebel, "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

CO Vs PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1				1	3	3	3
CO2				1	3	3	3
CO3				1	3	3	3
CO4				1	3	3	3
CO5				3	3	3	3

COURSE CODE	COURSE NAME	L	T	P	C
YEGOE1	ENGLISH FOR RESEARCH PAPER WRITING	2	0	0	0

UNIT I	**6**
Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and vagueness	
UNIT II	**6**
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	
UNIT III	**6**
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	
UNIT IV	**6**
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,	
UNIT V	**6**
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. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	

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

REFERENCES

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.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

CO Vs PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1			3	1	3	2	2
CO2			3	1	2	3	3
CO3			3	1	2	3	3
CO4			3	1	3	3	3
CO5			3	3	2	3	3

Semester	**II**	
Course Name	**BIO ENERGY SYSTEMS**	
Course Code	**YRE201**	
L –T –P –C **3 – 0 – 0– 3**	**C:P:A** **3:0:0**	**L –T –P –H** **3–0– 0 – 3**

CO	CO STATEMENT	Knowledge Level
CO1	***ntify*** different Biofuel types and explain their properties	**K3**
CO2	***mmarize*** the Government Policies and status of bio fuel in India.	**K3**
CO3	***tegorize*** Biomass types and explain their properties and applications	**K4**
CO4	***velop*** bioenergy conversion through biochemical route.	**K3**
CO5	***velop*** bioenergy conversion through thermochemical route.	**K3**
CO6	***n*** to improve the thermal efficiency by designing suitable systems for heat recovery and co-generation	**K3**

Objectives

- Describe the fundamentals of biofuel types and their generations.
- Identify the sources and definitions used for biomass and basic biomass conversion.
- Clearly define the extent of bioenergy use worldwide and the incentives or disincentives for use in India.
- Detail the digestion and fermentation Technologies in biogas plants.
- Detail the combustion and Gasification Technologies in common use.
- Describe the power generation scenario, the layout components of power plant and analyze Cogeneration cycle.

COURSE CONTENT		
UNIT I	**BIO FULES**	**9 Hours**
	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 Hours**
	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**	**9 Hours**
	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**	**9 Hours**
	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**	**9 Hours**
	Combustion of woody biomass – theory, calculations and design of equipment, Cogeneration in biomass processing industries. – Economic Case studies: Combustion of rice husk. Use of bagasse for cogeneration.	
Lecture =45 Hours	**Tutorial = 0 Hours**	**Total = 45 Hours**

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

REFERENCE BOOKS

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

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	2	1	2	1
CO2	2	1	1	3	3	3	3
CO3	2	2	2	1	2	1	3
CO4	2	2	2	1	2	1	3
CO5	2	2	2	1	2	1	3
CO6	3	3	2	1	3	2	2
Total	14	12	10	9	13	10	15

Semester	**I**	
Subject Name	**BIO ENERGY LABORATORY**	
Subject Code	**YRE207**	
L –T –P –C **0- 0 – 2– 2**	**C:P:A** **0:1:0**	**L –T –P –H** **0- 0– 2 – 4**

Course Outcome		**Domain/Level** **C or P or A**
CO1	***Calibrate*** the performance of Flue gas analysis and properties of given sample.	**P3**
CO2	***identify*** the chemical, Biological oxygen demand and calorific values of given fuel.	**P3**
CO3	***identify*** the Effect P_H levels on total dissolved solids	**P3**
CO4	***identify*** effect of milling time and particle size.	**P3**
CO5	***identify*** High Heating Value of given sample.	**P3**
CO6	***Demonstrate*** the operations in briquetting, biomass gasifier and biomethanation plant.	**P3**

Objectives

- Study the performance of Flue gas analysis
- Study the performance Bio fuels Flash point, Fire point and Calorific value

COURSE CONTENT

CO Relation

LIST OF EXPERIMENTS		**CO**
1.	Flue gas analysis – IC engine and gasifier	1
2.	Determine the Density and Specific Gravity of a given sample	1

3.	Proximate and Ultimate analysis of given sample	1
4.	Analysis of chemical oxygen demand (COD)	2
5.	Analysis of biological oxygen demand (BOD)	2
6.	Determining the Flash point, Fire point and Calorific value of Biofuel	2
7.	Effect of P_H on total dissolved solids (TDS)	3
8.	Determine the effect of milling time on the Particle size and size reduction of given sample using Ball milling machine	4
9.	Determine the higher heating value (HHV) of unleaded gasoline (or a similar fuel supplied by the instructor) using the adiabatic oxygen bomb calorimeter.	5
10.	Briquetting operation demonstration and study	6
11.	Biomethanation plant demonstration and study	6
12.	2kW Biomass gasifier demonstration and study	6
	TOTAL HOURS - 30	

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.
2. Klass D.L and Emert G.M, "Fuels from Biomass and Wastes", Ann Arbor Since Publ. Inc. Michigan, 1985.
3. O.P.Chawla, "Advances in Bio-gas Technology" I.C.A.R., New Delhi, 1970.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	3	3	1	2	1
CO2	3	3	2	2	1	2	1
CO3	3	3	2	2	1	2	1
CO4	3	3	3	3	1	2	3
CO5	3	2	3	3	1	2	1
CO6	3	3	2	2	1	2	1
Tot	18	15	15	15	6	12	8

COURSE CODE	COURSE NAME	L	T	P	C
YPSOE1	CONSTITUTION OF INDIA	2	0	0	0

UNIT I HISTORY AND PHIOLOSOPHY	**6**
History of Making of the Indian Constitution: History-Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution: Preamble-Salient Features	
UNIT IICONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES:	**6**
Fundamental Rights -Right to Equality-Right to Freedom-Right against Exploitation-Right to Freedom of Religion-Cultural and Educational Rights-Right to Constitutional Remedies-Directive Principles of State Policy-Fundamental Duties.	
UNIT IIIORGANS OF GOVERNANCE:	**6**
Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive-President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications-Powers and Functions	
UNIT IVLOCAL ADMINISTRATION	**6**
District's Administration head: Role and Importance, -Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	
UNIT VELECTION COMMISSION:	**6**
Election Commission: Role and Functioning. -Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.	

	LECTURE	TUTORIAL	TOTAL
	30	0	30

REFERENCES

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

CO Vs PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1				3		1	1
CO2				3		1	1
CO3				3		1	1
CO4				3		1	1
CO5				3		1	1

Semester	**I**	
Course Name	**FUELS AND COMBUSTION TECHNOLOGY**	
Course Code	**YRE104C**	
L –T –P –C **3 – 0 – 0– 3**	**C:P:A** **3:0:0**	**L –T –P –H** **3–0– 0 – 3**

CO Number	**CO STATEMENT**	**Knowledge Level**
CO1	***ve*** problems related to fuels, fuel analysis	**K3**
CO2	***ve*** problems related to combustion stoichiometry fuels & fuel analysis	**K3**
CO3	***ve*** problems related to various systems involving variety of elements.	**K3**
CO4	***ve*** problems related to flame, flame structure, ignition and ignitors	**K3**
CO5	***ve*** problems related to basics of furnaces	**K3**
CO6	***ve*** problems related to coal burning equipment	**K3**

COURSE CONTENT

UNIT I	**FUELS, FUEL ANALYSIS & COMBUSTION STOICHIOMETRY FUELS & FUEL ANALYSIS:**	**8 Hours**
	Types of fuel-Physical and chemical characteristics of solid, liquid, and gaseous fuels-Nonconventional fuel-producer gas, hydrogen, biogas etc- Determination of Calorific values-Ultimate and proximate analysis-problems associated with handlings, storage and combustion	
UNIT II	**COMBUSTION STOICHIOMETRY**	**10 Hours**
	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 **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 Hours**
	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 Hours**
	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 EQUIPMENT**	**7 Hours**
	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)	
Lecture =45 Hours	**Tutorial = 0 Hours**	**Total = 45 Hours**

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

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	0	0	2	2
CO2	3	2	2	0	0	2	2
CO3	3	2	2	0	0	2	2
CO4	3	2	3	0	0	2	1
CO5	2	2	2	0	0	2	1
CO6	2	2	2	0	0	2	1
Total	16	12	13	0	0	12	9

Semester	**I**	
Course Name	**ENVIRONMENTAL ENGINEERING**	
Course Code	**YRE105A**	
L –T –P –C **3 – 0 – 0– 3**	**C:P:A** **3:0:0**	**L –T –P –H** **3–0– 0 – 3**

CO Number	CO STATEMENT	Knowledge Level
CO1	*cognize* various biotic and abiotic environmental transformation processes of pollutants.	**K3**
CO2	*ntify* air pollution problems and interpret air quality data on chemical characteristic.	**K3**
CO3	*derstand* the importance of various microbial processes in wastewater treatment.	**K3**
CO4	*sess* the bacteriological status of water and aquatic systems.	**K3**
CO5	*derstand* the importance of various microbial processes in Solid Waste Disposal treatment.	**K3**
CO6	*tify* the use of pollution control equipment and their design.	**K3**

Objectives

- To inculcate among student sensitivity towards social and corporate responsibilities.
- To understand the transformation and degradation of organic pollutants in the environment.
- To understand different types of pollutions in the environment.
- To impart knowledge on soil sciences and develop understanding about pollutants fate and partitioning processes in soil.
- To understand the role of various microbes in waste water treatment.

COURSE CONTENT		
UNIT I	**ENVIRONMENTAL POLLUTION**	**10 Hours**
	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 Hours**
	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**	**09 Hours**
	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**	**09 Hours**
	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**	**07 Hours**
	Noise Criteria - Noise Sources - Noise Control Measures - Thermal Pollution - Oil pollution –Pesticides - Radioactivity Pollution control - Tanneries and other Industries and their control	
Lecture = 45 Hours	**Tutorial = 0 Hours**	**Total = 45 Hours**
TEXT BOOKS / REFERENCE BOOKS		

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

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

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	2	3	2	3
CO2	3	2	1	2	3	3	3
CO3	3	2	2	1	2	2	3
CO4	3	2	2	1	2	2	3
CO5	3	2	2	1	1	2	3
CO6	3	2	2	3	3	3	3
Total	18	12	11	10	14	14	18

Semester	**I**	
Course Name	**CARBON SEQUESTRATION AND TRADING**	
Course Code	**YRE105B**	
L –T –P –C **3 – 0 – 0– 3**	**C:P:A** **3:0:0**	**L –T –P –H** **3–0– 0 – 3**

CO Number	**CO STATEMENT**	**Knowledge Level**
CO1	***Identify*** the greenhouse gas concentration and analyses their impacts.	**K3**
CO2	***Examine*** the potential for carbon sequestration	**K4**
CO3	***Distinguish*** risk management and risk reduction techniques.	**K4**
CO4	***Develop*** suitable carbon economics for sustainability.	**K3**
CO5	***Interpret*** case studies for optimized carbon trading models.	**K5**
CO6	***Apply*** rules and regulations as best practice for managing public issues.	**K3**

Objectives

- Understand the problem of greenhouse gas and analyse the cause and effects.
- Apply principles for carbon Sequestration
- Manage risk associated with carbon trading and apply rules and regulation for problems.

COURSE CONTENT

UNIT I	**GREENHOUSE GAS**	**9 Hours**
	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 Hours**

	Practices for sequester carbon - car bon sequestration types – carbon credits – carbon testing – potential for carbon sequestration.	
UNIT III	**MANAGEMENT**	**9 Hours**
	Risk management and risk reduction – carbon economics – Verification of carbon change.	
UNIT IV	**CASE STUDIES**	**9 Hours**
	Carbon trading model – Century Model – Case Studies.	
UNIT V	**RULES AND REGULATIONS**	**9 Hours**
	Implication Methanol and Nitrous Oxide carbon bank – Best Management Practices Publics issues – policies.	
Lecture = 45 Hours	**Tutorial = 0 Hours**	**Total = 45 Hours**

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 2002 CRC Press
2. The Impact of Carbon Dioxide and Other Greenhouse Gases on Forest Ecosystems By David F. Karnosky Published 2001 CABI Publishing.

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	2	3	2	3
CO2	2	2	1	2	2	3	3
CO3	2	2	2	1	2	3	3
CO4	2	2	2	1	2	3	3
CO5	2	2	2	1	1	2	3
CO6	2	2	2	2	3	3	3
Total	12	12	11	9	13	16	18

Semester	**I**	
Course Name	**WASTE MANAGEMENT AND ENERGY RECOVERY**	
Course Code	**YRE105C**	
L –T –P –C **3 – 0 – 0– 3**	**C:P:A** **3:0:0**	**L –T –P –H** **3–0– 0 – 3**

CO Number	**CO STATEMENT**	**Knowledge Level**
CO1	***Categorize*** the different types and properties of solid waste	**K4**
CO2	***Develop*** appropriate methods for size reduction and composting	**K3**
CO3	***Analyze*** the environmental effects of incineration	**K4**
CO4	***Organize*** methods for efficient waste disposal.	**K3**
CO5	***Categorize*** the types hazardous waste and illustrate the management techniques and disposal methods.	**K4**
CO6	***Apply*** appropriate principles for energy generation from waste	**K3**

Objectives

- Understand the different sources of wastages and their properties.
- Apply principle for energy generation from the waste.

COURSE CONTENT

UNIT I	**SOLID WASTE**	**9 Hours**
	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**	**9 Hours**
	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 Hours**
	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**	**9 Hours**
	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**	**9 Hours**
	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.	

Lecture =45 Hours	Tutorial = 0 Hours	Total = 45 Hours

TEXT BOOKS / REFERENCE BOOKS

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.

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	3	3	2	3
CO2	3	2	2	2	3	2	3
CO3	3	3	2	2	3	2	3
CO4	3	3	2	3	3	2	3
CO5	3	3	2	3	3	2	3
CO6	3	3	2	3	3	3	3
Total	18	16	12	16	18	13	18

COURSE CODE	COURSE NAME	L	T	P	C
YRE204A	OPTIMUM UTILISATION OF HEAT AND POWER	3	0	3	3

After completion of the course, a student will be able to

1. ***Discuss*** the energy transfer and conversion methodologies.
2. ***Discuss*** the concepts of Combined Heat and Power and their usage in various sectors.
3. ***Explain*** the pinch technology and their concepts
4. ***Design*** the process retrofit and its integration
5. ***Analysis*** of energy recovery through heat exchangers, heat pumps and heat pipes
6. ***Describe*** the application of combined heat and power.

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 the industrial sector - Processing - energy requirements - source of waste heat.

	LECTURE	TUTORIAL	TOTAL
	45	0	45

REFERENCES

1. Eastop T.D & Croft D.R, “Energy efficiency for engineers and Technologists”, 2nd edition, Longman Harlow, 1990.
2. O’Callaghan, Paul W, “Design and Management for energy conservation”, Pergamon, 1993.

CO Vs PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	1	1	2	1
CO2	3	3	2	2	1	1	1
CO3	3	3	3	1	1	1	1
CO4	2	2	3	1	1	1	1
CO5	1	3	3	2	1	1	1
CO6	3	3	2	2	1	1	1

Total	15	16	16	9	6	7	6

COURSE CODE	**COURSE NAME**	**L**	**T**	**P**	**C**
YRE204C	**SUSTAINABLE DEVELOPMENT**	**3**	**0**	**3**	**3**

After completion of the course, a student will be able to

7. Discuss the effect of industrial ecology and analyze industrial pollution control.
8. Discuss the barriers and role of industry in cleaner production concept
9. Derive the cleaner production assessment and technical feasibility analysis
10. Analysis of cleaner production economics and financing
11. Describe the environment management system
12. Explain the environment audit system.

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 approaches.

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

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

CO Vs PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	3	2	1	1	2
CO2	3	3	3	2	1	1	1
CO3	2	2	3	1	2	2	3
CO4	2	3	1	2	2	2	3
CO5	2	2	3	3	2	3	1
CO6	2	2	3	3	2	3	1
Total	11	18	16	13	10	12	11

Semester	**II**	
Course Name	**HYDRO POWER TECHNOLOGY**	
Course Code	**YRE204D**	
L –T –P –C **3 – 0 – 0– 3**	**C:P:A** **3:0:0**	**L –T –P –H** **3–0– 0– 3**

CO Number	**CO STATEMENT**	**Knowledge Level**
CO1	***Discuss*** the fundamental concepts behind the hydrology and hydro power projects with their terminologies	**K2**
CO2	***scribe*** the principles of conversion of these water resources to useful form of energy through the development of proto type systems	**K3**
CO3	***lect*** the suitable water turbines based on the requirements and the necessity of the project work.	**K3**
CO4	***plain*** the concepts of water turbines with their basic design requirements in relation to the economic operation hydro power projects.	**K3**
CO5	***scribe*** basic design and construction of hydroelectric power stations and their life cycle analysis	**K3**
CO6	***Explain*** the small, mini, micro hydro power plants with their turbines in relation to reliability, energy generation and economical aspects.	**K3**

Objectives

- To learn and understand the fundamental concepts behind the hydrology and hydro power projects.
- Understanding principles of conversion of water resources to useful form of energy through the development of proto type systems
- Understand the basic design concepts of various water turbines along with their selection parameters and their maintenance
- Ability to define the small, mini, micro hydro power plants with their turbines in relation to energy generation and economical aspects.

COURSE CONTENT

UNIT I	**HYDROLOGY`**	**10 Hours**
	Overview of Hydropower Systems-Preliminary Investigation-Rainfall and run off measurements-Hydrographs-Flow duration graph and mass storage graphs-determination of site selection- Types hydroelectric 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**	**8 Hours**
	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- case studies.	
UNIT III	**SELECTION AND ANALYSIS OF TURBINES**	**9 Hours**
	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 Updating and Refurbishing of Turbines- case study.	
UNIT IV	**HYDRO POWER STATION OPERATION, MAINTENANCE AND TROBLE SHOOTING**	**10 Hours**
	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**	**8 Hours**
	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.	
Lecture = 45 Hours	**Tutorial = 0 Hours**	**Total = 45 Hours**

TEXT BOOKS / REFERENCE BOOKS

1. L.Monition,M.Lenir and J.Roux,Micro Hydro Electric Power Station, Published by Wiley, New York, (1985)
2. AlenR. Inversin,Micro Hydro Power Source Book (1986)
3.J. Paul Guyer ,An Introduction to Mechanical design of Hydro Electric Power Plants (Dams and Hydro Electric Power Plants)
4.Charles simeons ,Hydro Power-the use of water as an alternative source of Energy
5. Jog, M. G Hydro-Electric and Pumped Storage Plants, Published by Wiley, New York, (1989)
6. Bryan Leyland ,Small hydroelectric engineering practice-, Published by CRC Press
7. C.C. Warnik, Hydropower Engineering- Published by Prentice Hall

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	1	1	1	1	1
CO2	2	1	1	1	1	1	1
CO3	2	1	1	1	1	1	1
CO4	2	1	1	1	1	1	1

CO5	2	1	1	1	1	1	1
CO6	2	1	1	1	1	1	1
Total	12	6	6	6	6	6	6

1- Low, 2 – Medium, 3- High

Semester	**II**	
Course Name	**HYDROGEN, FUEL CELLS AND NUCLEAR ENERGY**	
Course Code	**YRE205B**	
L –T –P –C **3 – 0 – 0– 3**	**C:P:A** **3:0:0**	**L –T –P –H** **3–0– 0 – 3**

CO Number	**CO STATEMENT**	**Knowledge Level**
CO1	***ntify*** the production and storage method for hydrogen energy	**K3**
CO2	***velop*** storage technologies for batteries	**K3**
CO3	***velop*** storage technologies for fuel cell	**K3**
CO4	***amine*** the nuclear energy conversion and different types of reactors.	**K4**
CO5	***spect*** the nuclear power plant by considering safety aspects.	**K4**
CO6	***n*** appropriate techniques for managing nuclear wastes.	**K3**

Objectives

- Understand and apply basic concepts of hydrogen energy and storage cells.
- Apply the concept of nuclear energy for power generation by optimizing the design and following safety norms.
- Understand the concept of nuclear waste management and use proper techniques for efficient management.

COURSE CONTENT

UNIT I	**HYDROGEN ENERGY**	**9 Hours**
	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 Hours**
	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 ENERGY AND FUELS**	**9 Hours**
	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 Hours**
	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 Hours**
	Segregation and safe disposal of nuclear waste –case studies	
Lecture = 45 Hours	**Tutorial = 0 Hours**	**Total = 45 Hours**

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

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	2	2	2	2
CO2	3	2	2	2	2	3	3
CO3	3	2	2	2	2	2	2
CO4	3	2	2	2	3	2	1
CO5	3	2	2	2	3	2	1
CO6	3	3	2	2	3	3	3

Tot	18	13	12	12	15	14	12

1 - Low, 2 – Medium, 3- High

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.

M.TECH-RENEWABLE ENERGY –PART TIME- 2022-23 ACADEMIC YEAR

QRE303C – 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

QRE401A - 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, Nicad & Nimh 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

QREOE1A 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, and 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.

QREOE1B - 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 Nethanl and Nitrous Oxide carbon bank – Best Management Practices 0 Publics issues – policies. **L:45; Total:45**

TEXT BOOKS

1. Emission Trading:Environmental Policies New approach-Richard F. Kosobud,
2.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

ENTREPRENEURSHIP DEVELOPMENT

Course Outcomes (XUM 405):		Domain	Level
CO1	***Recognise*** and ***describe*** the personal traits of an entrepreneur.	Cognitive Affective	Understand Receiving
CO2	***Determine*** the new venture ideas and ***analyze*** the feasibility report.	Cognitive	Understand Analyze
CO3	***Develop*** the business plan and ***analyze*** the plan as an individual or in team.	Cognitive Affective	Receiving Analyze
CO4	***Describe*** various parameters to be taken into consideration for launching and managing small business.	Cognitive	Understand
CO5	***Describe*** Technological management and Intellectual Property Rights	Cognitive	Understand

COURSE CODE	**COURSE NAME**	**L**	**T**	**P**	**C**
XUM 405	**ENTREPRENEURSHIP DEVELOPMENT**	**3**	**0**	**0**	**3**
C:P: A = 2:0:1		**L**	**T**	**P**	**H**
		3	**0**	**0**	**3**

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 start-up 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.	

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

TEXTBOOKS

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,
2. Biztrantra ,2nd Edition.
3. Prasanna Chandra, 2009, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill.
4. P.Saravanavel, 1997, Entrepreneurial Development, Ess Pee kay Publishing House, Chennai.
5. Arya Kumar,2012, Entrepreneurship: Creating and Leading an Entrepreneurial Organisation, Pearson Education India.
6. Donald F Kuratko, T.V Rao, 2012, Entrepreneurship: A South Asian perspective, Cengage Learning India.
7. Dinesh Awasthi, Raman Jaggi, V.Padmanand, Suggested Reading / Reference Material
8. 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/

Mapping of COs with POs

	GA 1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	0	0	0	0	0	0	0	0	3	3	3	1
CO 2	0	0	1	2	3	2	1	1	1	2	3	0
CO 3	0	0	0	0	0	1	0	2	3	3	0	2
CO 4	0	0	0	0	0	1	1	2	3	0	3	3
CO 5	0	0	0	0	0	1	1	3	0	0	0	3
Total	0	0	1	2	3	5	3	8	10	8	9	9
Scaled	0	0	1	1	1	2	1	2	3	2	2	2

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**
XUM606	**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 support system and other systems – Geographic information systems – Intranets and extranets – video cing. 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

E REFERENCES

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1		1	1					1			1	1	2	2
CO 2			2		3						2	2	2	2
CO 3						2	2				1	1		1
CO 4		2	2		1	1	1	2	1	1	3	1	1	
CO 5						2	3	3		2	1	1	2	2
Total	0	3	5	0	4	5	6	6	1	3	8	6	7	7
Scaled	0	1	1	0	1	1	1	1	1	1	2	1	2	2

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

HUMAN ETHICS, VALUES, RIGHTS AND GENDER

Course Outcomes:		Domain	Level
CO1	Adapt the human values and Social Justice.	Cognitive Affective	Knowledge and Responding
CO2	Discuss and accept Gender Equality, empowerment and feminism.	Cognitive Affective	Comprehensionand Valuing
CO3	Recognize the status of women and analyse the issues related to women.	Cognitive Affective	Comprehensionand Valuing
CO4	Demonstrate the human rights and good governance.	Cognitive Affective	Comprehension Responding
CO5	Adapt the human values and Social Justice.	Cognitive Affective	Apply Responding

COURSE CODE	COURSE NAME	L	T	P	C
XUM703	**HUMAN ETHICS, VALUES, RIGHTS AND GENDER EQULITY**	**3**	**0**	**0**	**3**
C:P: A		**L**	**T**	**P**	**H**
3:0:0		**3**	**0**	**0**	**3**

UNIT- I: Human Values **9**

Human Ethics and values - Understanding of oneself and others- Basic instincts, motives and needs- Social service, Social Justice, Dignity and worth, Harmony in human relationship: Familyand Society, Integrity and Competence, Caring and Sharing, Honesty and Courage, Valuing Time,Co-operation, Commitment, Sympathy and Empathy, Self-Confidence and Personality- Living inharmony at various levels.

UNIT- II: Gender Equality **9**

Gender Equality - Gender Vs Sex -, Concepts, definition, Gender equity, equality, and empowerment. Status of Women in India Social, Economic, 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 Rightsand Duties Universal Declaration of Human Rights (UDHR), Civil, Political, Economic, Social
and Cultural Rights, Rights against torture, Discrimination and forced Labour, Rights of Children.

UNIT- V: Good Governance **9**

Good Governance - Democracy, People's Participation, Guaranteed Freedoms, Open and Transparency governance, Combating corruption, Fairness in criminal justice administration, Government system of Redressal, Judiciary, National Human Rights Commission and other statutory Commissions, Creation of Human Rights Literacy and Awareness.

	LECTURE	TUTORIAL	TOTAL
	45	0	45

TEXTBOOKS

1. Alam, Aftab ed., Human Rights in India: 1999Issues and Challenges (New Delhi: Raj Publications,)
2. Bajwa, G.S. and D.K. Bajwa, 1996 Human Rights in India: Implementation and Violations(New Delhi: D.K. Publications,)
3. Chatrath, K. J. S., (ed.), 1998) Education for Human Rights and Democracy (Shimala: IndianInstitute of Advanced Studies,).
4.Jagadeesan.P., 1990. Marriage and Social legislations in Tamil Nadu, Elachiapen pub,Chennai,
5. Kaushal, Rachna, 2000 Women and Human Rights in India (New Delhi: Kaveri Books,)
6. Mani. V. S., 1998)Human Rights in India: An Overview (New Delhi: Institute for the WorldCongress on Human Rights,)
7. Singh Sehgal, B. P. 1999 (ed) Human Rights in India: Problems and Perspectives (New Delhi:Deep and Deep,)
8. Veeramani K. (1996), Periyar on Women Right, Emerald Publishers, Chennai , India. 9..Veeramani.K (2010) (ed) Periyar Feminism.Periyar ManiammaiUniversity,Vallam, Thanjavur.
10. Status Report 1976, Govt. of India.

Mapping of COs 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	PSO 1	PSO 2
CO 1			3		3	2		2						
CO 2			3		1	2		3						
CO 3			2		2	2		3						
CO 4			3		3	3		3						
CO 5			1		1	1		1						
Total			12		10	10		12						
Scaled			3		2	2		3						

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

COURSE CODE	XUM704	L	T	P	C
COURSE NAME	BIOLOGY	3	0	0	0
C:P:A	3:0:0	L	T	P	C
		3	0	0	3

COURSE OUTCOMES		Domain
CO1	To describe how biological observations of 18th Century that lead to major discoveries.	Cognitive
CO2	Explain the cell morphology and their functions	Cognitive
CO3	Explain the cell functioning and the physiological system	Cognitive
CO4	To classify the Biomolecules and to understand the essential of Amino Acids DNA/RNA	Cognitive Affective
CO5	Apply Biological sciences in Engineering Applications.	Cognitive Affective

COURSE CONTENT		Hours
UNIT I	**Introduction**	6
	Fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. - Why we need to study biology? - Biological observations of 18th Century that lead to major discoveries. - Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor.	
UNIT II	**Cell Biology**	9
	Introduction to the cell biology – Cell size and shape - Chemical composition -Classification of cell and its properties; Cell membrane- Nucleus –Mitochondria- Endoplasmic Reticulum Lysosome and Peroxisome; Microscopy and its types.	
UNIT III	**Cell Physiology**	9
	Cell cycle; Cell signaling, Transport across cell membrane; Introduction to Human physiology – Circulatory system - Respiratory system - Excretory system – Nervous system.	
UNIT IV	**Biomolecules**	9
	Molecules of life - Monomeric units and polymeric structures - Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.	
UNIT V	**Modern Applications in Biological Sciences**	12
	Principles and Application of Biosensor; Basics of Biochips – Bio fertilizer – Bioinformatics – Bio fuel – Introduction to Bio mechanics - Neural Network: Artificial Intelligence (AI) - Stem Cell; Introduction to Genetics; Genetic Engineering and its Application, Safety Hazardous Effect.	
	Total Hours	45

TEXT BOOKS/REFERENCE BOOKS

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

2) Dr. Sohini Singh and Dr. Tanu Allen, “Biology for Engineers”, Vayu Education of India, New Delhi, 2014.

References:

1) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons
2) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
3) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
4) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers
5)Biology for Engineers (ISBN: 9781121439931), TMH

Online References:

i) www.bio12.com/ch3/RaycroftNotes.pdf
ii) www.engineering.uiowa.edu/bme050/cvb-solids.pdf
iii) www.biologyjunction.com/mendelian_genetics.html

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO												PSO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	1	0	1	2	1	0	0	3	3	2	1
CO2	2	2	2	1	0	1	2	1	0	0	3	3	3	1
CO3	3	2	1	1	0	1	2	1	0	0	3	3	2	1
CO4	2	2	1	1	0	1	2	1	0	0	3	3	1	1
CO5	3	2	1	2	0	1	2	1	0	0	3	3	2	1
	13	10	6	6	0	5	10	5	0	0	15	15	10	5

1-5→1, 6-10→2, 11-15→3

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

COURSE CODE	XUM001	L	T	P	SS	C
COURSE NAME	HUMAN ETHICS, VALUES, RIGHTS AND GENDER EQUALITY	1	0	0	1	1
PREREQUISITES	Not Required	L	T	P	SS	H
C:P:A	0.8:0.1:0.1	1	0	0	1	2

COURSE OUTCOMES		Domain	Level
CO1	***Relate*** and ***Interpret*** the human ethics and human relationships	Cognitive	Remember, Understand
CO2	***Explain*** and ***Apply*** gender issues, equality and violence against women	Cognitive	Understand, Apply
CO3	***Classify*** and ***Develop*** the identify of women issues and challenges	Cognitive & Affective	Analyze Receive
CO4	***Classify*** and ***Dissect*** human rights and report on violations.	Cognitive	Understand, 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 **3+3**

HUMAN ETHICS AND VALUES

Human Ethics and values - Family and Society, Social service, Social Justice, Integrity, Caring and Sharing, Honesty and Courage, Time Management, Co-operation, Commitment, Sympathy and Empathy, Self respect, Self-Confidence, Personality Development

UNIT II GENDER EQUALITY **3+3**

Gender Discrimination in society and in family, Gender equity, equality, and empowerment. Social and Economic Status of Women in India in Education, Health, Employment, Definition of HDI, GDI and GEM. Contributions of Dr.B.R. Ambethkar, Thanthai Periyar and Phule to Women Empowerment.

UNIT III WOMEN ISSUES AND CHALLENGES **3+3**

Women Issues and Challenges- Female Infanticide and Feticide, Violence against women, Domestic violence, Sexual Harassment, Trafficking, Remedial Measures – Acts related to women: Political Right, Property Rights, and Rights to Education, Dowry Prohibition Act.

UNIT IV HUMAN RIGHTS **3+3**

Human Rights and Duties, Universal Declaration of Human Rights (UDHR), Civil, Political, Economical, Social and Cultural Rights, Rights against torture, Forced Labour, Child helpline- Intellectual Property Rights (IPR) and its types. National Policy on occupational safety and health.

UNIT V GOOD GOVERNANCE **3+3**

Good Governance - Democracy, People's Participation, Transparency in governance and audit, Corruption, Impact of corruption on society and Remedial measures, Government system of Redressal. Creation of People friendly environment and universal brotherhood.

	LECTURE	SELF STUDY	TOTAL
	15	15	30

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
11. Central Vigilance Commission (Gov. of India) website: http://cvc.nic.in/welcome.html.
12. Weblink of Transparency International: https://www.transparency.org/
13. Weblink Status report: https://www.hrw.org/world-report/2015/country-chapters/india

Table 1 : Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1								2						
CO2								3	1					
CO3								2						
CO4								3		2				
CO5								3	2	2		2		
Total		2						13	3	4		2		
Scaled Value		1						3	1	1		1		

1 – 5 → 1, 6-10 → 2, 11 – 15→ 3

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

	SEMESTER II	L	T	P	SS	C
COURSE CODE	**XUM002**	**1**	**0**	**0**	**1**	**1**
COURSE NAME	**ENVIRONMENTAL STUDIES**	**L**	**T**	**P**	**SS**	**H**
C: P: A	**0.7:0:0.3**	**1**	**0**	**0**	**1**	**2**

COURSE OUTCOMES:		**Domain**	**Level**
CO1	***Describe*** the significance of natural resources and ***explain*** anthropogenic impacts.	Cognitive	Remember Understand
CO2	***Illustrate*** the significance of ecosystem, biodiversity and natural geo bio chemical cycles for maintaining ecological balance.	Cognitive	Understand
CO3	***Identify*** the facts, consequences, preventive measures of major pollutions and ***recognize*** the disaster phenomenon.	Cognitive Affective	Remember Receiving
CO4	***Explain*** the socio-economic, policy dynamics and ***practice*** the control measures of global issues for sustainable development.	Cognitive	Understand Analyse
CO5	***Recognize*** the impact of population and the concept of various welfare programs, and ***apply*** the modern technology towards environmental protection.	Cognitive Psychomotor	Understand Apply

UNIT - I NATURAL RESOURCES AND ENERGY	**3+3**
World Environment Day and its need- Forest resources: Use, Deforestation– Water resources: over-utilization of surface and ground water- Mineral resources: Environmental effects of mining– Food resources: Modern agriculture, Fertilizer-Pesticide problems, Water logging, Salinity-Energy resources: Renewable and Non-renewable energy sources; Alternate energy resources-Role Of individual in Conservation of Resources.	
UNIT - II ECOSYSTEMS AND BIODIVERSITY	**3+3**
Structure and function of an ecosystem – Producers, consumers and decomposers – Biogeochemical cycles- Food chains, Food webs, Structure and Function of the Forest ecosystem and Aquatic ecosystem– Introduction to Biodiversity- Endemic, Extinct and Endangered species- Conservation of Biodiversity: In-situ and Ex-situ conservation.	
UNIT – III ENVIRONMENTAL POLLUTION	**3+3**
Definition – Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards – Solid waste management: Causes, effects and control measures of industrial wastes – Role of an individual in prevention of pollution – Pollution case studies.	
UNIT –IV SOCIAL ISSUES AND THE ENVIRONMENT	**3+3**
Rain water harvesting– Resettlement and Rehabilitation of people, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and Holocaust – Environment Protection Act – Water Act – Wildlife Protection Act – Forest Conservation Act.	
UNIT –V HUMAN POPULATION AND THE ENVIRONMENT	**3+3**
Population growth, Variation among nations - Population explosion - Environment and Human	

health- HIV / AIDS – Role of Information Technology in Environment and human health – Case studies.				
LECTURE	**TUTORIALS**	**PRACTICALS**		**TOTAL**
30	**0**	**-------**		**30**
	TEXT BOOKS			
	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).			
	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).			
	E RESOURCES			
	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			

Mapping of COs with POs

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	0	0	0	1	0	3	1
CO2	1	0	0	0	0	0	2	2
CO3	0	0	0	1	1	0	1	0
CO4	0	0	0	0	0	0	1	1
CO5	0	0	0	0	0	0	1	1
Total	2	0	0	1	2	0	8	5
Scaled to 1, 2, 3	1	0	0	1	1	0	2	1

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

COURSE CODE			**COURSE NAME**	**L**	**T**	**P**	**C**
XUM003/XUMA301			**DISASTER MANAGEMENT**	**1**	**0**	**0**	**1**
C	**P**	**A**		**L**	**T**	**SS**	**H**
1	0	0		**1**	**0**	**1**	**2**

COURSE OUTCOMES On the successful completion of this course students would able to		**Domain**	**Level**
CO1	***Relate*** and ***Interpret*** the Disaster and its' classification.	Cognitive	Remembering, Understanding
CO2	***Explain*** and ***Apply*** Disaster cycle, Institutional Processes and Framework	Cognitive	Understand, Apply
CO3	***Understand*** the Factors affecting Vulnerabilities violations.	Cognitive	Analysing
CO4	***Analyze*** Disaster Risk Management in India	Cognitive	Understand
CO5	***Evaluate*** the Case Studies	Cognitive	Remembering,Response

UNIT – I: INTRODUCTION TO DISASTERS	**6+0+0**
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc – Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.– Differential impacts– in terms of caste, class, gender, age, location, disability – Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change– Dos and Don'ts during various types of Disasters	
UNIT – II: APPROACHES TO DISASTER RISK REDUCTION	**6+0+0**

Disaster cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural– non structural measures, Roles and responsibilities of– community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake–holders– Institutional Processes and Framework at State and Central Level– State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies

UNIT – III: INTER–RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT	**6+0+0**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land–use etc.– Climate Change Adaptation– IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT – IV: DISASTER RISK MANAGEMENT IN INDIA	**6+0+0**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT – V: DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS	**6+0+0**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

	LECTURE	**TUTORIAL**	**TOTAL**
HOURS	**30**	**0**	**30**

TEXT BOOKS

1. Singhal J.P., (2010) Disaster Management, Laxmi Publications.
2. Tushar Bhattacharya, (2012) Disaster Science and Management, McGraw Hill India Education Pvt. Ltd.,

REFERENCE BOOKS

1. Gupta, A.K., & Nair, S.J., (2011) Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi.
2. Kapur Anu, (2010) Vulnerable India, A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi.

Mapping of COs with POs

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1					3	2	
CO2	2					1	2	
CO3	1					2	2	1
CO4	1					2	2	1
CO5						3	2	3
Total	5					11	10	5
Scaled to 1, 2, 3	2					2	2	2

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

COURSE CODE	**XUM004**	**L**	**T**	**P**	**SS**	**C**
COURSE NAME	**INTRODUCTION TO ENTREPRENEURSHIP**	**1**	**0**	**0**	**1**	**1**
PREREQUISITES	NIL	**L**	**T**	**P**	**SS**	**H**
C:P:A	**1:0:0**	**1**	**0**	**0**	**1**	**2**

COURSE OUTCOMES

Cos	Outcome	Domain	Level
CO1	***Understand*** the concept of Entrepreneurship	Cognitive	Understanding
CO2	***Understand*** about an Entrepreneur	Cognitive	Understanding
CO3	***Understand*** the characteristics of Entrepreneur	Cognitive	Understanding
CO4	***Understand*** the ways to acquire skills of Entrepreneur	Cognitive	Understanding
CO5	***Understand*** the concept of Intrapreneurship	Cognitive	Understanding

UNIT I INTRODUCTION TO ENTREPRENEURSHIP **3+3**

Meaning and Concept of Entrepreneurship, History of Entrepreneurship Development, Role of Entrepreneurship in Economic Development, Myths about Entrepreneurs, Agencies in Entrepreneurship Management and Future of Entrepreneurship

UNIT II THE ENTREPRENEUR **3+3**

Gender Discrimination in society and in family, Gender equity, equality, and empowerment. Social and Economic Status of Women in India in Education, Health, Employment, Definition of HDI, GDI and GEM.

Contributions of Dr.B.R. Ambethkar, Thanthai Periyar and Phule to Women Empowerment.	
UNIT III CHARACTERISTICS OF AN ENTREPRENEUR	**3+3**
Introduction - Characteristic Features of Successful Indian Entrepreneurs - Differences between an Entrepreneur and a Manager - Difference between an Entrepreneur and an Intrapreneur - Relationship between the terms Entrepreneur, Entrepreneurial and Entrepreneurship - Difference between a Scientist, Inventor and Entrepreneur - Relationship between Entrepreneur and Enterprise - Difference between Entrepreneur and Enterprise - Difference between a Self-employed person and Entrepreneur - Common Myths on Entrepreneur	
UNIT IV SKILLS FOR AN ENTREPRENEUR	**3+3**
Business Management Skills - Communication and active listening skills - Risk-taking skills – Networking Skills – Critical Thinking Skills – Problem Solving Skills – Creative Thinking Skills – Customer Service Skills – Financial Skills – Leadership Skills – Time Management and Organizational Skills – Technical Skills	
UNIT V INTRAPRENEURSHIP	**3+3**
What is Intrapreneurship – Understanding Intrapreneurship – Types of Intrapreneurs – Characteristics of Intrapreneurs – Examples of Intapreneurship	

	LECTURE	**SELF STUDY**	**TOTAL**
	15	**15**	**30**

Text Book

1. Jayashree Suresh, Entrepreneurial Development, Margham Publications.

Reference Books

1. 1.Essentials of Entrepreneurship and Small Business Management (6th Edition) by Norman M. Scarborough (Paperback - Jan 13, 2010)
2. Entrepreneurship and Small Business Management, Student Edition by Glencoe McGraw-Hill (Hardcover - Feb 24, 2005)
3. Vasant Desai, Dynamics of Entrepreneurship Development, Star Publication, New Delhi.

e-References

1 https://in.indeed.com/career-advice/career-development/entrepreneur-skills

2 https://www.investopedia.com/terms/i/intrapreneurship.asp

Mapping of COs with POs

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3							
CO2	2			2	1			1
CO3	2	1	3	3	1		2	1
CO4	1	1	2	3	2	3		
CO5	2	1	1	3				
Total	10	3	6	11	4	3	2	2
Scaled to 1, 2, 3	**2**	**1**	**2**	**2**	**1**	**1**	**1**	**1**

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

COURSE CODE			**COURSE NAME**	**L**	**T**	**P**	**C**
XUM005			**CYBER SECURITY**	**1**	**0**	**0**	**1**
C	**P**	**A**		**L**	**T**	**SS**	**H**
1	**0**	**0**		**1**	**0**	**1**	**2**

COURSE OUTCOMES On the successful completion of this course students would able to		**Domain**	**Level**
CO1	***Understand*** the fundamentals of Cyber Security and the technologies.	Cognitive	Understand
CO2	***Understand*** the organizational structure of Cyber security	Cognitive	Understand
CO3	***Understand*** the Cyber Security policy development	Cognitive	Understand
CO4	***Understand*** the Indian IT act and the initiatives	Cognitive	Understand
CO5	***Understand*** and ***Apply*** the Cyber security practices	Cognitive	Understand Apply

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 – II: CYBER 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 – III: CYBER 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– Computer Forensics – Steganography	
UNIT – IV: CYBER SECURITY INITIATIVES AND IT ACT	**9**
Counter Cyber Security Initiatives in India, Cyber Security Excercsie, Cyber Security Incident Handling, Cyber Security Assurance, IT Act, Hackers–Attacker–Counter measures ,Web Application Security , Digital Infrastructure Security ,Defensive Programming. Traditional Problems Associated with Computer Crime, Introduction to Incident Response.	
UNIT – V: SECURITY PRACTICES	**9**
Guidelines to choose web browsers, Securing web browser ,Antivirus ,Email security ,Guidelines for setting up a Secure password ,Two–steps authentication ,Password Manager ,Wi–Fi Security ,Guidelines for social media security ,Tips and best practices for safer Social Networking. Basic Security for Windows, User Account Password Introduction to mobile Smartphone Security ,Android Security ,IOS Security Online Banking Security ,Mobile Banking Security ,Security of Debit and Credit Card ,UPI Security Security of Micro ATMs e–wallet Security Guidelines Security Guidelines for Point of Sales(POS)	

	LECTURE	TUTORIAL	TOTAL
HOURS	45	0	45

TEXT 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. Cyber Laws & Information Technology, Jothi Rathan,Vijay Rathan,Bhrath Pubishers,7th Edition January 2019.

REFERENCE BOOKS

1.Modern Cyber security Practices by Pascal Ackerman, BPB Publications,2020
2. Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011
3. Rhodes–Ousley, Mark, "Information Security: The Complete Reference", Second Edition, McGraw–Hill, 2013.

E–REFERENCES

1. https://www.coursera.org/specializations/cyber–security
2. www. nptel.ac.in
3. http://professional.mit.edu/programs/short–programs/applied–cybersecurity https://us.norton.com/internetsecurity–how–to–cyber–security–best–practices–for–employees. html

4. https://www.meity.gov.in/content/cyber–laws

Mapping of COs with POs

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	0	0	0	0	0	2	0	3
CO2	0	0	0	0	0	0	2	0
CO3	3	0	0	0	0	2	3	0
CO4	0	0	0	0	0	0	0	0
CO5	3	0	0	0	0	0	0	0
Total	6	0	0	0	0	4	5	3
Scaled to 1, 2, 3	2	0	0	0	0	1	1	1

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

COURSE CODE	**COURSE NAME**	**L**	**T**	**P**	**SS**	**C**
XCYOE2	**PHARMACEUTICAL CHEMISTRY**	**3**	**0**	**0**	**0**	**3**
PREREQUISITES	**Nil**	**L**	**T**	**P**	**SS**	**H**
C:P:A	**2.5:0:0.5**	**3**	**0**	**0**	**0**	**3**

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Recall*** the various terminology of pharmaceutical chemistry.	Cognitive	Remember Understand
CO2	***Outline*** the structural aspects of antibiotics and ***relate*** their functions.	Cognitive	Understand
CO3	***Illustrate*** the biological activities of analgesic and antipyretics.	Cognitive Affective	Remember Understand Receive
CO4	***Explain*** the action mechanism of drug.	Cognitive Affective	Understand Respond
CO5	***Describe*** the important medicinal plant and its action.	Cognitive	Analyze

UNIT I	**BASICS OF PHARMACEUTICALCHEMISTRY**	**15**
Definitions – terminology – drugs, pharmacology, pharmacy, chemotherapy, therapeutics – first aid – important rules of first aids,– tuberculosis, jaundice, piles, typhoid, malaria, cholera – causes – symptoms, diagnosis – prevention and treatment.		
UNIT II	**ANTIBIOTICS**	**15**
Definition – introduction – classification and biological actions – penicillin, chloramphenicol, streptomycin and tetracycline – structure, properties and therapeutic uses.		
UNIT III	**ANALGESIC AND ANTIPYRETICS**	**15**

Narcotic analgesic – analgesic action of morphine – derivatives of morphine – heroin and apomorphine – Non narcotic analgesic – aspirin and paracetamol – preparation, properties and uses		
UNIT IV	**ANTICANCER AND COVID DRUGS**	**15**
Anticancer drug – Dostarlimab – Discovery, design and development – mode of action– COVID drug – Remdesivir and deoxy glucose – mechanism of action – uses		
UNIT V	**PHYTOCHEMICAL SCREENING OF MEDICINAL PLANTS**	**15**
Extraction of plant phytoconstituents, function and uses-Tulasi, Neem, Kizhanelli, Alovera, Semparuthi, Nilavembu, Adadodai and Thoothvelai.		

LECTURE	TUTORIAL	SELF STUDY	PRACTICAL	TOTAL
45	**-**	**-**	**-**	**45**

TEXT BOOKS

1. Jayashree Ghosh, A Text Book of Pharmaceutical Chemistry; 5th Ed., S.Chand and Company Ltd., New Delhi, (2014).

REFERENCES

1. S. Lakshmi; Pharmaceutical Chemistry; 1st Ed., S. Chand and Company Ltd., New Delhi, (1995).
2. Bhagavathi Sundari; Applied Chemistry; 1st Ed., MJP Publishers, Chennai, (2006).

COURSE CODE	COURSE NAME	L	T	P	SS	C	H
XCYOE3	**CLIMATE CHANGE**	**3**	**0**	**0**	**0**	**3**	**3**
C:P:A = 2.5: 0 : 0.5							

COURSE OUTCOMES- On the successful completion of the course, students will be able to		**DOMAIN**	**LEVEL**
CO1	***Recall*** the concepts of weather and climate and can also **illustrate** the current state of climate change and the causes for this change.	Cognitive	Remember Understand
CO2	Relate the causes of global warming and ***recognize*** the impact of climate change.	Cognitive	Understand Apply
CO3	***Outline*** the concepts of mitigation measures and ***discuss*** the measures against global warming.	Cognitive & Affective	Understand Receive
CO4	***Identify*** the simple climate models.	Cognitive	Apply
CO5	***Classify*** the plans and methods of the international organizations involved in mitigation measures.	Cognitive	Understand

UNIT – I BASICS OF WEATHER AND CLIMATE	**9**

Introduction to Environment. Evolution of the earth's atmosphere. Characteristics and Structure of Atmosphere, Chemistry of atmospheric particles and gases; smog-types and processes, photochemical processes; ions and radicals in atmosphere. Overview of key concepts – weather and climate; Climatic variability - temperature, humidity, rainfall, wind speed & direction, precipitation. Causes of Climate change- Natural and human causes.

UNIT – II EARTH'S CLIMATE SYSTEM	**9**

Global warming and greenhouse effect – major greenhouse gases, sources and sinks of greenhouse gases; Ozone layer depletion, issues and advance research to protect the Ozone layer and consequences; ground level ozone and air pollution; melting of ice, sea level rise and its impact; Earth's energy balance; Carbon cycle; Heat and cold waves; global dimming; Impact of climate change on economy and spread of human diseases, monitoring and assessment.

UNIT – III CLIMATE CHANGE AND MITIGATION MEASURES	**9**

Definitions of mitigation and an overview of emissions levels and mitigation targets per country. CDM and Carbon Trading -Clean Technology, biodiesel, compost, biodegradable plastics -Renewable energy usage as an alternative -Mitigation Technologies and Practices within India and around the world -Non-renewable energy supply to all sectors -Carbon sequestration -International and regional cooperation for waste disposal, biomedical wastes, hazardous wastes, e-wastes, industrial wastes, etc.,

UNIT IV: CLIMATE CHANGE MODELS	**9**

Constructing a climate model – climate system modeling – climate simulation and drift – Evaluation of climate model simulation – regional (RCM) – global (GCM) – Global average response to warming – climate change observed to date.

UNIT V: GLOBAL AND NATIONAL INITIATIVES IN CLIMATE CHANGE	**9**

Climate Change and Carbon Credits-Clean Development Mechanism (CDM), CDM in India. United Nation Framework Convention on climate change (UNFCCC) – Key provisions of the UNFCCC, its structure, and different party groups under the convention. The Kyoto protocol and its associated bodies. National Projects related to climate

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

TEXT BOOKS

6. Robin Moilveen, Fundamentals of weather and climate (2nd Edition) (2010), Oxford University Press.
7. Hardy, J.T.Climate Change: Causes, Effects and Solutions. John Wiley &Sons(2003).
8. Harvey, D. Climate and Global Climate Change. Prentice Hall (2000).
9. J. David Neelin, Climate change and climate modeling, (2011) Cambridge University press

REFERENCE BOOKS

1. Barry, R. G. Atmosphere, Weather and Climate. Routledge Press, (2003), UK.
2. Gillespie, A. Climate Change, Ozone Depletion and Air Pollution: Legal Commentaries with Policy and Science Considerations, (2006), Martinus Nijhoff Publishers.
3. Manahan, S.E.Environmental Chemistry. CRC Press (2010), Taylor and Francis Group.
4. Dey.A.K.Environmental Chemistry, V Ed., New Age International Publishers, (2005).
5. Maslin, M.Climate Change: A Very Short Introduction. Oxford Publications, (2014).
6. Mathez, E.A. Climate Change: The Science of Global Warming and our EnergyFuture. Columbia

University Press,(2009).
7. Mitra, A.P., Sharma, S., Bhattacharya, S., Garg, A., Devotta, S. &Sen, K. 2004. Climate Change and India. Universities Press, India.
8. Adaptation and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge,2006.
9. John Houghton, Global Warming: The Complete Briefing, 5th Edition, 2015, Cambridge Univ. Press.

E RESOURCES

11. https://www.metoffice.gov.uk/weather/climate/science/the-science-behind-climatechange
12. https://www.rmets.org/resource/what-climate-change
13. https://climate.nasa.gov/
14. https://earthobservatory.nasa.gov/
15. https://scied.ucar.edu/learning-zone/climate
16. https://www.noaa.gov/education/resource-collections/climate
17. https://www.globalchange.gov/browse/educators
18. https://unfccc.int/

COURSE CODE	XUM106 / XUMA106	L	T	P		C
COURSE NAME	HUMAN ETHICS, VALUES, RIGHTS AND GENDER EQUALITY	1	0	0		1
PREREQUISITES	Not Required	L	T	P	SS	H
C:P:A	2.7:0:0.3	1	0	0	2	3

COURSE OUTCOMES		Domain	Level
CO1	***Relate*** and ***Interpret*** the human ethics and human relationships	Cognitive	Remember, Understand
CO2	***Explain*** and ***Apply*** gender issues, equality and violence against women	Cognitive	Understand, Apply
CO3	***Classify*** and ***Develop*** the identify of women issues and challenges	Cognitive & Affective	Analyze Receive
CO4	***Classify*** and ***Dissect*** human rights and report on violations.	Cognitive	Understand, 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

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**	**11**

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.

	LECTURE	**SELF STUDY**	**TOTAL**
	15	**30**	**45**

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).
11. Planning Commission report on Occupational Health and Safety http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_occup_safety.p
11. Central Vigilance Commission (Gov. of India) website: http://cvc.nic.in/welcome.html.
12. Weblink of Transparency International: https://www.transparency.org/
13. Weblink Status report: https://www.hrw.org/world-report/2015/country-chapters/india

COURSE CODE	XES202/XUMA202	L	T	SS	P	C
COURSE NAME	ENVIRONMENTAL STUDIES	2	0	1	0	2
C:P:A	1.4: 0.3 : 0.3	L	T	SS	P	H
		2	0	1	0	3

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Describe*** the significance of natural resources and ***explain*** anthropogenic impacts.	Cognitive	Remember Understand
CO2	***Illustrate*** the significance of ecosystem, biodiversity and natural geo bio chemical cycles for maintaining ecological balance.	Cognitive	Understand
CO3	***Identify*** the facts, consequences, preventive measures of major pollutions and ***recognize*** the disaster phenomenon	Cognitive Affective	Remember Receive
CO4	***Explain*** the socio-economic, policy dynamics and ***practice*** the control measures of global issues for sustainable development.	Cognitive	Understand Apply
CO5	***Recognize*** the impact of population and the concept of various welfare programs, and ***apply*** the modern technology towards environmental protection.	Cognitive	Understand Analysis

UNIT - I INTRODUCTION TO ENVIRONMENTAL STUDIES AND ENERGY	**12**

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies – Water resources: Use and over-utilization of surface and ground water, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: renewable and non-renewable energy sources – Land resources: Land as a resource, land degradation, 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 – 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 – 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	**1**

	0
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– Environment and human health – HIV / AIDS– Role of Information Technology in Environment and human health. 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	SELF STUDY	TOTAL
HOURS	**30**	**0**	**0**	**15**	**45**

TEXT BOOKS

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

REFERENCE BOOKS

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.
6. G.K.Ghosh, Disaster Management, A.P.H.Publishers, New Delhi, 2006.

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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
13. http://www.faadooengineers.com/threads/7894-Environmental-Science

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.

COURSE CODE	YBA103	L	T	P	C
COURSE NAME	ECONOMICS FOR MANAGERS	3	0	0	3
PREREQUISITE:	Nil	L	T	P	H
C:P:A	3 : 0 : 0	3	0	0	3

LEARNING OBJECTIVES

1. To learn the principles of economics.
2. To learn the laws of supply and demand.
3. To learn the economies and diseconomies of scale.
4. To learn the various market structures.
5. To learn macroeconomics concepts, fiscal and monetary policy concepts.

COURSE OUTCOMES		Domain	Level
CO1	***Explain*** the principles of economics	Cognitive	Understanding
CO2	***Explain*** the laws of supply and demand	Cognitive	Understanding
CO3	***Explain*** production costs and the economies and diseconomies of scale.	Cognitive	Understanding
CO4	***Explain*** various market structures.	Cognitive	Understanding
CO5	***Explain*** the macroeconomics concepts, inflation fiscal and monetary policies, Sourcing options and coordination in supply chains	Cognitive	Understanding

UNIT I – INTRODUCTION **9**

Fundamentals of economics, principles of economics, circular flow diagram, production possibilities frontier, Economics Nobel laureates.

UNIT II – SUPPLY AND DEMAND **9**

Supply and Demand – Demand, Law of demand, factors that affect demand, supply, law of supply, factors that affect supply, elasticity, elastic demand, inelastic demand, elastic supply, inelastic supply.

UNIT III – ECONOMIES OF SCALE **9**

Production Cost Curves, short run cost, Long run cost economies of scale, Diseconomies of scale.

UNIT IV – COMPETITIVE MARKETS **9**

Markets – competitive markets, decision to shut down, decision to exit, profit, monopoly, causes for monopoly, monopoly profit, price discrimination, oligopoly, monopolistic competition.

UNIT V – GROSS DOMESTIC PRODUCT **9**

Nations Income – Gross domestic product, components of GDP, Cost of living, calculation of CPI, WPI, PMI. Fiscal policy, monetary policy, inflation, balance of payment, game theory, prosoners dilemma, oligopolies as prisoners dilemma, bargaining.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	0	0	45

TEXT BOOKS
1. N. Gregory Mankiw – Principles of economics, 6th Ed, Cengage Learning, 2016. **2.** S.Sankaran – Business Economics – Margham Publications, Chennai, 2014
REFERENCES
1. Gregory Mankiw, Economics – Principles and Applications, Cengage learning. 2. Dutt, Sundaram, Indian Economic Development – S.chand Publications, 2014

Table:1 Mapping of POs with Cos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO 1	3	0	0	0	0	0	0	0	0	0	0
CO 2	3	0	0	0	0	0	0	0	0	0	0
CO 3	3	0	0	0	0	0	0	0	0	0	0
CO 4	3	0	0	0	0	0	0	0	0	0	0
CO 5	3	0	0	0	0	0	0	0	0	0	0
Total	15	0	0	0	0	0	0	0	0	0	0
Scaled Value	3	0	0	0	0	0	0	0	0	0	0

1-5 → 1 6-10 → 2 11-15 → 3

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

<table>
<tr><td>IV</td><td>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.</td><td>9+0+0</td></tr>
<tr><td>V</td><td>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 .</td><td>10+0+0</td></tr>
<tr><td></td><td><table><tr><th>Lecture</th><th>Tutorial</th><th>Total</th></tr><tr><td>45</td><td>-</td><td>45</td></tr></table>(Weightage of Marks, theory 100%)</td><td></td></tr>
<tr><td colspan="3">Text Books
1. Shailendra Kumar Business Ethics First Edition, Cengage Learning India Pvt. Ltd.
2. Niraj KumarMr. Paras Tripathi, Business Ethics, Himalaya Publishing House.</td></tr>
<tr><td colspan="3">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.</td></tr>
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