

**THAMIRABHARANI ENGINEERING COLLEGE**

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)

Chathirampudukulam, Chidambaranagar - Vepenkulam Road.

Thatchanallur, Tirunelveli 627 358, Tamil Nadu.

**1.3.1 Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human values, Environment and Sustainability into the curriculum**

Regulation	Programme Code	Programme name	Semester	Course Code	Course Name	Cross cutting issues	Page No.
2021	103, 104, 105, 106 & 114	1. Civil Engineering 2. Computer Science and Engineering 3. Electrical and Electronics Engineering 4. Electronics and Communication Engineering 5. Mechanical Engineering	1	IP3151	Induction Programme	Human values	3
			1	CY3151	Engineering Chemistry	Sustainability	5
			2	-	NCC Credit Course Level 1	Human values and Gender	7
			4	GE3451	Environmental Sciences and Sustainability	Environment and Sustainability	10
			7	GE3791	Human Values and Ethics	Professional Ethics and Human values	11
			4	-	NCC Credit Course Level 2	Human values and Gender	12
			6	-	NCC Credit Course Level 3	Human values and Gender	15
	103	Civil Engineering	3	CE3303	Water Supply and Wastewater Engineering	Environment and Sustainability	18

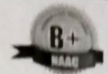
Principal
THAMIRABHARANI ENGG COLLEGE
Tirunelveli, Tamilnadu-627 358



1.3.1 Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human values, Environment and Sustainability into the curriculum

Regulation	Programme Code	Programme name	Semester	Course Code	Course Name	Cross cutting issues	Page No.
2017	104	Computer Science and Engineering	7	GE8071	Disaster Management	Environment and Sustainability	19
	105	Electrical and Electronics and Engineering					
	104	Computer Science and Engineering	7	OEE752	Introduction to Renewable Energy Systems	Sustainability	20
	106	Electronics and Communication Engineering	5	ORO551	Renewable Energy Sources	Sustainability	21
	106	Electronics and Communication Engineering	7	OBM752	Hospital Management	Environment and Sustainability	22
	105	Electrical and Electronics and Engineering	7	EE8703	Renewable Energy Systems	Sustainability	23
	104	Computer Science and Engineering	8	GE8076	Professional Ethics in Engineering	Professional Ethics	24
	103	Civil Engineering	5	GE8074	Human Rights	Human values and Gender Equity	25
			5	OAI551	Environment and Agriculture	Environment	26
			7	EN8591	Municipal Solid Waste Management	Environment and Sustainability	27
			5	EN8491	Water Supply Engineering	Environment	28
			6	EN8592	Wastewater Engineering	Environment	29
	8	CE8016	Groundwater Engineering	Environment	30		

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IP3151 INDUCTION PROGRAMME

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

“Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.”

“One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. “

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor



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each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References:

Guide to Induction program from AICTE

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CY3151 ENGINEERING CHEMISTRY

L T P C 3 0 0 3

OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT I WATER AND ITS TREATMENT 9

Water: Sources and impurities, Water quality parameters: Definition and significance of colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, flouride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralisation and zeolite process.

UNIT II NANO CHEMISTRY 9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III PHASE RULE AND COMPOSITES 9

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process.

Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO₂ emission and carbon foot print.

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9



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Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles-working principles; Fuel cells: H₂-O₂ fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

REFERENCES:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

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NCC Credit Course Level I NX3251 (ARMY WING) NCC Credit Course Level - I

L T P C 2 0 0 2

NCC GENERAL

NCC 1	Aims, Objectives & Organization of NCC	6
NCC 2	Incentives	1
NCC 3	Duties of NCC Cadet	2
NCC 4	NCC Camps: Types & Conduct	1
		2

NATIONAL INTEGRATION AND AWARENESS

NI 1	National Integration: Importance & Necessity	4
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT

PD 1	Self-Awareness, Empathy, Critical & Creative Thinking,	7
	Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP

L 1	Leadership Capsule: Traits, Indicators, Motivation,	5
	Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhansi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT

SS 1	Basics, Rural Development Programmes, NGOs,	8
	Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

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NCC Credit Course Level I
NX3252 (NAVAL WING) NCC Credit Course Level - I

L T P C 2 0 0 2

NCC GENERAL

NCC 1	Aims, Objectives & Organization of NCC	6
NCC 2	Incentives	1
NCC 3	Duties of NCC Cadet	2
NCC 4	NCC Camps: Types & Conduct	1

NATIONAL INTEGRATION AND AWARENESS

NI 1	National Integration: Importance & Necessity	4
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT

PD 1	Self-Awareness, Empathy, Critical & Creative Thinking,	7
	Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP

L 1	Leadership Capsule: Traits, Indicators, Motivation,	5
	Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhansi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT

SS 1	Basics, Rural Development Programmes, NGOs,	8
	Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

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NCC Credit Course Level 1

NX3253 (AIR FORCE WING) NCC Credit Course Level - I

L T P C 2 0 0 2

NCC GENERAL		6
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		4
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		7
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		5
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhansi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		8
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

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GE3451 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY

L T P C 2 0 0 2

UNIT I ENVIRONMENT AND BIODIVERSITY

6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT II ENVIRONMENTAL POLLUTION

9

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.

UNIT III RENEWABLE SOURCES OF ENERGY

6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV SUSTAINABILITY AND MANAGEMENT

6

Development , GDP ,Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry- A case study.

UNIT V SUSTAINABILITY PRACTICES

6

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cyclescarbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socioeconomical and technological change.

TEXT BOOKS:

TOTAL: 30 PERIODS

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCE BOOKS:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. edition 2010.

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GE3791 HUMAN VALUES AND ETHICS

L T P C 2 0 0 2

UNIT I DEMOCRATIC VALUES

Understanding Democratic values: Equality, Liberty, Fraternity, Freedom, Justice, Pluralism, Tolerance, Respect for All, Freedom of Expression, Citizen Participation in Governance – World Democracies: French Revolution, American Independence, Indian Freedom Movement. Reading Text: Excerpts from John Stuart Mills' On Liberty

6

UNIT II SECULAR VALUES

Understanding Secular values – Interpretation of secularism in Indian context - Disassociation of state from religion – Acceptance of all faiths – Encouraging non-discriminatory practices. Reading Text: Excerpt from Secularism in India: Concept and Practice by Ram Puniyani

6

UNIT III SCIENTIFIC VALUES

Scientific thinking and method: Inductive and Deductive thinking, Proposing and testing Hypothesis, Validating facts using evidence based approach – Skepticism and Empiricism – Rationalism and Scientific Temper. Reading Text: Excerpt from The Scientific Temper by Antony Michaelis R

6

UNIT IV SOCIAL ETHICS

Application of ethical reasoning to social problems – Gender bias and issues – Gender violence – Social discrimination – Constitutional protection and policies – Inclusive practices. Reading Text: Excerpt from 21 Lessons for the 21st Century by Yuval Noah Harari

6

UNIT V SCIENTIFIC ETHICS

Transparency and Fairness in scientific pursuits – Scientific inventions for the betterment of society – Unfair application of scientific inventions – Role and Responsibility of Scientist in the modern society. Reading Text: Excerpt from American Prometheus: The Triumph and Tragedy of J.Robert Oppenheimer by Kai Bird and Martin J. Sherwin.

6

TOTAL: 30 PERIODS

REFERENCES:

1. The Nonreligious: Understanding Secular People and Societies, Luke W. Galen Oxford University, Press, 2016.
2. Secularism: A Dictionary of Atheism, Bullivant, Stephen; Lee, Lois, Oxford University Press, 2016.
3. The Oxford Handbook of Secularism, John R. Shook, Oxford University Press, 2017.
4. The Civic Culture: Political Attitudes and Democracy in Five Nations by Gabriel A. Almond and Sidney Verba, Princeton University Press,
5. Research Methodology for Natural Sciences by Soumitro Banerjee, IISc Press, January 2022

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NCC Credit Course Level 2 NX3451 (ARMY WING) NCC Credit Course Level - II

L T P C 3 0 0 3

PERSONALITY DEVELOPMENT 9

PD 3 Group Discussion: Change your mindset, Time Management, Social Skills 6

PD 5 Public Speaking 3

LEADERSHIP 7

L 2 Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 7

DISASTER MANAGEMENT 13

DM 1 Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation 3

DM 2 Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters 9

DM 3 Fire Service & Fire Fighting 1

ENVIRONMENTAL AWARENESS & CONSERVATION 3

EA 1 Environmental Awareness and Conservation 3

GENERAL AWARENESS 4

GA 1 General Knowledge 4

ARMED FORCES 6

AF 1 Armed Forces, Army, CAPF, Police 6

ADVENTURE 1

AD 1 Introduction to Adventure Activities 1

BORDER & COASTAL AREAS 2

BCA 1 History, Geography & Topography of Border/Coastal areas 2

TOTAL: 45 PERIODS

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NCC Credit Course Level 2
NX3452 (NAVAL WING) NCC Credit Course Level - II

LT P C 3 0 0 3

PERSONALITY DEVELOPMENT 9

PD 3 Group Discussion: Change your mindset, Time Management, Social Skills 6

PD 5 Public Speaking 3

LEADERSHIP 7

L 2 Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty,
Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 7

DISASTER MANAGEMENT 13

DM 1 Disaster Management Capsule: Organisation, Types of Disasters, Essential Services,
Assistance, Civil Defence Organisation 3

DM 2 Initiative Training, Organising Skills, Do's & Don'ts,

Natural Disasters, Man Made Disasters 9

DM 3 Fire Service & Fire Fighting 1

ENVIRONMENTAL AWARENESS & CONSERVATION 3

EA 1 Environmental Awareness and Conservation 3

GENERAL AWARENESS 4

GA 1 General Knowledge 4

NAVAL ORIENTATION 6

AF 1 Armed Forces and Navy Capsule 3

EEZ 1 EEZ Maritime Security and ICG 3

ADVENTURE 1

AD 1 Introduction to Adventure Activities 1

BORDER & COASTAL AREAS 2

BCA 1 History, Geography & Topography of Border/Coastal areas 2

TOTAL: 45 PERIODS

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NCC Credit Course Level 2

NX3453 (AIR FORCE WING) NCC Credit Course Level - II

L T P C 3 0 0 3

PERSONALITY DEVELOPMENT 9

PD 3 Group Discussion: Change your mindset, Time Management, Social Skills 6

PD 5 Public Speaking 3

LEADERSHIP 7

L 2 Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 7

DISASTER MANAGEMENT 13

DM 1 Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation 3

DM 2 Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters 9

DM 3 Fire Service & Fire Fighting 1

ENVIRONMENTAL AWARENESS & CONSERVATION 3

EA 1 Environmental Awareness and Conservation 3

GENERAL AWARENESS 4

GA 1 General Knowledge 4

GENERAL SERVICE KNOWLEDGE 6

GSK 1 Armed Forces & IAF Capsule 2

GSK 2 Modes of Entry in IAF, Civil Aviation 2

GSK 3 Aircrafts - Types, Capabilities & Role 2

ADVENTURE 1

AD 1 Introduction to Adventure Activities 1

BORDER & COASTAL AREAS 2

BCA 1 History, Geography & Topography of Border/Coastal areas 2

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NCC Credit Course Level 3
NX3651 (ARMY WING) NCC Credit Course - III

LT P C 3 0 0 3

PERSONALITY DEVELOPMENT 9

PD 3 Group Discussion: Team Work 2

PD 4 Career Counselling, SSB Procedure & Interview Skills 3

PD 5 Public Speaking 4

BORDER & COASTAL AREAS 4

BCA 2 Security Setup and Border/Coastal management in the area 2

BCA 3 Security Challenges & Role of cadets in Border management 2

ARMED FORCES 3

AF 2 Modes of Entry to Army, CAPF, Police 3

COMMUNICATION 3

C 1 Introduction to Communication & Latest Trends 3

INFANTRY 3

INF 1 Organisation of Infantry Battalion & its weapons 3

MILITARY HISTORY 23

MH 1 Biographies of Renowned Generals 4

MH 2 War Heroes - PVC Awardees 4

MH 3 Study of Battles - Indo Pak War 1965, 1971 & Kargil 9

MH 4 War Movies 6

TOTAL: 45 PERIODS

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**NCC Credit Course Level 3
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PERSONALITY DEVELOPMENT 9

PD 3 Group Discussion: Team Work 2

PD 4 Career Counselling, SSB Procedure & Interview Skills 3

PD 5 Public Speaking 4

BORDER & COASTAL AREAS 4

BCA 2 Security Setup and Border/Coastal management in the area 2

BCA 3 Security Challenges & Role of cadets in Border management 2

NAVAL ORIENTATION 6

NO 3 Modes of Entry - IN, ICG, Merchant Navy 3

AF 2 Naval Expeditions & Campaigns 3

NAVAL COMMUNICATION 2

NC 1 Introduction to Naval Communications 1

NC 2 Semaphore 1

NAVIGATION 2

N 1 Navigation of Ship - Basic Requirements 1

N 2 Chart Work 1

SEAMANSHIP 15

MH 1 Introduction to Anchor Work 2

MH 2 Rigging Capsule 6

MH 3 Boatwork - Parts of Boat 2

MH 4 Boat Pulling Instructions 2

MH 5 Whaler Sailing Instructions 3

FIRE FIGHTING FLOODING & DAMAGE CONTROL 4

FFDC 1 Fire Fighting 2

FFDC 2 Damage Control 2

SHIP MODELLING 3

SM Ship Modelling Capsule 3

TOTAL: 45 PERIODS

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Thatchanallur, Tirunelveli 627 358, Tamil Nadu.



NCC Credit Course Level 3 NX3653 (AIR FORCE WING) NCC Credit Course Level - III

L T P C 3 0 0 3

PERSONALITY DEVELOPMENT 9

PD 3 Group Discussion: Team Work 2

PD 4 Career Counselling, SSB Procedure & Interview Skills 3

PD 5 Public Speaking 4

BORDER & COASTAL AREAS 4

BCA 2 Security Setup and Border/Coastal management in the area 2

BCA 3 Security Challenges & Role of cadets in Border management 2

AIRMANSHIP 1

A 1 Airmanship 1

BASIC FLIGHT INSTRUMENTS 3

FI 1 Basic Flight Instruments 3

AERO MODELLING 3

AM 1 Aero Modelling Capsule 3

GENERAL SERVICE KNOWLEDGE 2

GSK 4 Latest Trends & Acquisitions 2

AIR CAMPAIGNS 6

AC 1 Air Campaigns 6

PRINCIPLES OF FLIGHT 6

PF 1 Principles of Flight 3

PF 2 Forces acting on Aircraft 3

NAVIGATION 5

NM 1 Navigation 2

NM 2 Introduction to Met and Atmosphere 3

AERO ENGINES 6

E 1 Introduction and types of Aero Engine 3

E 2 Aircraft Controls 3

TOTAL : 45 PERIODS

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**CE303 WATER SUPPLY AND WASTEWATER ENGINEERING****L T P C 4 0 0 4****UNIT I WATER SUPPLY****12**

Estimation of surface and subsurface water resources - Predicting demand for water - Impurities of water and their significance - Physical, chemical and bacteriological analysis - Waterborne diseases - Standards for potable water. Intake of water: Pumping and gravity schemes.

UNIT II WATER TREATMENT**12**

Objectives - Unit operations and processes - Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation - Clariflocculator - Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - softening, removal of iron and manganese - Defluoridation - Softening - Desalination process - Residue Management - Construction, Operation and Maintenance aspects 64

UNIT III WATER STORAGE AND DISTRIBUTION**12**

Storage and balancing reservoirs - types, location and capacity. Distribution system: layout, hydraulics of pipe lines, pipe fittings, valves including check and pressure reducing valves, meters, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations - House service connections.

UNIT IV PLANNING AND DESIGN OF SEWERAGE SYSTEM**12**

Characteristics and composition of sewage - Population equivalent - Sanitary sewage flow estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - Sewer appurtenances - Corrosion in sewers - Prevention and control - Sewage pumping-drainage in buildings - Plumbing systems for drainage

UNIT V SEWAGE TREATMENT AND DISPOSAL**12**

Objectives - Selection of Treatment Methods - Principles, Functions, - Activated Sludge Process and Extended aeration systems - Trickling filters - Sequencing Batch Reactor(SBR) - UASB - Waste Stabilization Ponds - Other treatment methods - Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects. - Discharge standards-sludge treatment -Disposal of sludge

TOTAL: 60 PERIODS**TEXTBOOKS:**

1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2016.
3. Garg, S.K., Environmental Engineering Vol.II, Khanna Publishers, New Delhi, 2015.
4. Duggal K.N., "Elements of Environmental Engineering" S. Chand and Co. Ltd., New Delhi, 2014.
5. Punmia, B.C., Jain, A.K., and Jain.A.K., Environmental Engineering, Vol.II, Laxmi Publications, 2010.

REFERENCES:

1. Punmia B.C, Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi 2010.
2. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
3. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.
5. Metcalf and Eddy - Waste water Engineering - Treatment and Reuse, Tata Mc. Graw - Hill Company, New Delhi, 2010.
6. Syed R.Qasim "Waste water Treatment Plants", CRC Press, Washington D.C., 2010
7. Gray N.F, "Water Technology", Elsevier India Pvt.Ltd. New Delhi, 2006.



GE8071 DISASTER MANAGEMENT

LTPC3003

UNIT I INTRODUCTION TO DISASTERS

9

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 (DRR)

9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- 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

9

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

9

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

9

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.

TOTAL: 45 PERIODS

TEXTBOOKS:

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. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009.



OEE752 INTRODUCTION TO RENEWABLE ENERGY SYSTEMS

L T P C 3 0 0 3

UNIT I INTRODUCTION

9

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION

9

Reference theory fundamentals-principle of operation and analysis: IG and PMSG

UNIT III POWER CONVERTERS

9

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS

9

Stand alone operation of fixed and variability speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS

9

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

TEXT BOOK:

1. S. N. Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
2. B.H.Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company, New Delhi,2009.

REFERENCES:

1. Rashid .M. H "power electronics Hand book", Academic press, 2001.
2. Ion Boldea, "Variability speed generators", Taylor & Francis group, 2006.
3. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.
4. Gray, L. Johnson, "Wind energy system", prentice hall linc, 1995.
5. Andrzej M. Trzynadlowski, „Introduction to Modern Power Electronics“, Second edition, wiley India Pvt. Ltd, 2012.

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ORO551 RENEWABLE ENERGY SOURCES

L T P C 3 0 0 3

UNIT I PRINCIPLES OF SOLAR RADIATION

10

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT II SOLAR ENERGY COLLECTION

8

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT III SOLAR ENERGY STORAGE AND APPLICATIONS

7

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT IV WIND ENERGY

10

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT V GEOTHERMAL ENERGY:

9

Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Rai G.D. , "Non-Conventional Energy Sources", Khanna Publishers, 2011
2. Twidell & Wier, "Renewable Energy Resources", CRC Press (Taylor & Francis), 2011

REFERENCES:

1. Tiwari and Ghosal, "Renewable energy resources", Narosa Publishing House, 2007
2. Ramesh R & Kumar K.U , "Renewable Energy Technologies",Narosa Publishing House, 2004
3. Mittal K M , "Non-Conventional Energy Systems", Wheeler Publishing Co. Ltd, New Delhi, 2003
4. Kothari D.P, Singhal ., K.C., "Renewable energy sources and emerging technologies", P.H.I, New Delhi, 2010

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OBM752 HOSPITAL MANAGEMENT

LTPC3003

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION	9
Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning- Equipment Planning – Functional Planning	
UNIT II HUMAN RESOURCE MANAGEMENT IN HOSPITAL	9
Principles of HRM – Functions of HRM – Profile of HRD Manager –Human Resource Inventory – Manpower Planning.	
UNIT III RECRUITMENT AND TRAINING	9
Different Departments of Hospital, Recruitment, Selection, Training Guidelines – Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.	
UNIT IV SUPPORTIVE SERVICES	9
Medical Records Department – Central Sterilization and Supply Department – Pharmacy – Food Services - Laundry Services.	
UNIT V COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL	9
Purposes – Planning of Communication, Modes of Communication – Telephone, ISDN, Public Address and Piped Music – CCTV.Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules.	
TOTAL: 45 PERIODS	

TEXT BOOKS:

1. R.C.Goyal, "Hospital Administration and Human Resource Management", PHI – Fourth Edition, 2006.
2. G.D.Kunders, "Hospitals – Facilities Planning and Management – TMH, New Delhi – Fifth Reprint 2007.

REFERENCES:

1. Cesar A.Caceres and Albert Zara, "The Practice of Clinical Engineering, Academic Press, New York, 1977.
2. Norman Metzger, "Handbook of Health Care Human Resources Management", 2nd edition Aspen Publication Inc. Rockville, Maryland, USA, 1990.
3. Peter Berman "Health Sector Reform in Developing Countries" - Harvard University Press, 1995.
4. William A. Reinke "Health Planning For Effective Management" - Oxford University Press.1988
5. Blane, David, Brunner, "Health and SOCIAL Organization: Towards a Health Policy for the 21st Century", Eric Calrendon Press 2002.
6. Arnold D. Kalcizony & Stephen M. Shortell, "Health Care Management", 6th Edition Cengage Learning, 2011.

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EE8703 RENEWABLE ENERGY SYSTEMS

LTPC3003

UNIT I RENEWABLE ENERGY (RE) SOURCES

9

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.

UNIT II WIND ENERGY

9

Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs-Working of WPPs- Siting of WPPs-Grid integration issues of WPPs.

UNIT III SOLAR PV AND THERMAL SYSTEMS

9

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

UNIT IV BIOMASS ENERGY

9

Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT V OTHER ENERGY SOURCES

9

Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications. Energy Storage System- Hybrid Energy Systems.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Joshua Earnest, Tore Wizeliu, 'Wind Power Plants and Project Development', PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan "Renewable Energy Sources and Emerging Technologies", PHI Learning Pvt.Ltd, New Delhi, 2013.
3. Scott Grinnell, "Renewable Energy & Sustainable Design", CENGAGE Learning, USA, 2016.

REFERENCES

1. A.K.Mukerjee and Nivedita Thakur," Photovoltaic Systems: Analysis and Design", PHI Learning Private Limited, New Delhi, 2011
2. Richard A. Dunlap," Sustainable Energy" Cengage Learning India Private Limited, Delhi, 2015.
3. Chetan Singh Solanki, " Solar Photovoltaics : Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2011
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis," Engineering Applications in Sustainable Design and Development", Cengage Learning India Private Limited, Delhi, 2016.
5. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
6. Shobh Nath Singh, 'Non-conventional Energy resources' Pearson Education ,2015.

CS



GE8076 PROFESSIONAL ETHICS IN ENGINEERING

LT P C 3 0 0 3

UNIT I HUMAN VALUES

10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS

9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES

8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, —Ethics in EngineeringI, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, —Engineering EthicsI, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, —Engineering EthicsI, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and CasesI, Cengage Learning, 2009.
3. John R Boatright, —Ethics and the Conduct of BusinessI, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and EngineersI, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, —Business Ethics: Decision Making for Personal Integrity and Social ResponsibilityI Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, _ Value Education', Vethathiri publications, Erode, 2011.

Web sources:

1. www.onlineethics.org
2. www.nspe.org
3. www.globlethics.org
4. www.ethics.org

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GE8074 HUMAN RIGHTS

L T P C 3 0 0 3

UNIT I	9
Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.	
UNIT II	9
Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.	
UNIT III	9
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.	
UNIT IV	9
Human Rights in India – Constitutional Provisions / Guarantees.	
UNIT V	9
Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.	

TOTAL: 45 PERIODS

REFERENCES:

1. Kapoor S.K., —Human Rights under International law and Indian Lawsl, Central Law Agency, Allahabad, 2014.
2. Chandra U., —Human Rightsl, Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

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OAI551 ENVIRONMENT AND AGRICULTURE

L T P C 3 0 0 3

UNIT I ENVIRONMENTAL CONCERNS 8
Environmental basis for agriculture and food – Land use and landscape changes – Water quality issues – Changing social structure and economic focus – Globalization and its impacts – Agro ecosystems.

UNIT II ENVIRONMENTAL IMPACTS 9
Irrigation development and watersheds – mechanized agriculture and soil cover impacts – Erosion and problems of deposition in irrigation systems – Agricultural drainage and downstream impacts – Agriculture versus urban impacts.

UNIT III CLIMATE CHANGE 8
Global warming and changing environment – Ecosystem changes – Changing blue-green-grey water cycles – Water scarcity and water shortages – Desertification.

UNIT IV ECOLOGICAL DIVERSITY AND AGRICULTURE 10
Ecological diversity, wild life and agriculture – GM crops and their impacts on the environment – Insects and agriculture – Pollination crisis – Ecological farming principles – Forest fragmentation and agriculture – Agricultural biotechnology concerns.

UNIT V EMERGING ISSUES 10
Global environmental governance – alternate culture systems – Mega farms and vertical farms – Virtual water trade and its impacts on local environment – Agricultural environment policies and its impacts – Sustainable agriculture.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. M.Lakshmi Narasaiah, Environment and Agriculture, Discovery Pub. House, 2006.
2. Arvind Kumar, Environment and Agriculture, ABH Publications, New Delhi, 2005.

REFERENCES:

1. T.C. Byerly, Environment and Agriculture, United States. Dept. of Agriculture. Economic Research Service, 2006.
2. Robert D. Havener, Steven A. Breth, Environment and agriculture: rethinking development issues for the 21st century : proceedings of a symposium, Winrock International Institute for Agricultural Development, 1994
3. Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium, Bangkok, Thailand. 1989

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EN8591 MUNICIPAL SOLID WASTE MANAGEMENT

L T P C 3 0 0 3

UNIT I SOURCES AND CHARACTERISTICS 9

Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal of solid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics - Elements of integrated solid waste management - Requirements and salient features of Solid waste management rules (2016) - Role of public and NGO's- Public Private participation - Elements of Municipal Solid Waste Management Plan.

UNIT II SOURCE REDUCTION, WASTE STORAGE AND RECYCLING 8

Waste Management Hierarchy - Reduction, Reuse and Recycling - source reduction of waste - On-site storage methods - Effect of storage, materials used for containers - segregation of solid wastes - Public health and economic aspects of open storage - case studies under Indian conditions - Recycling of Plastics and Construction/Demolition wastes.

UNIT III COLLECTION AND TRANSFER OF WASTES 8

Methods of Residential and commercial waste collection - Collection vehicles - Manpower - Collection routes - Analysis of waste collection systems; Transfer stations -location, operation and maintenance; options under Indian conditions - Field problems- solving.

UNIT IV PROCESSING OF WASTES 12

Objectives of waste processing - Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options - case studies under Indian conditions.

UNIT V WASTE DISPOSAL 8

Land disposal of solid waste- Sanitary landfills - site selection, design and operation of sanitary landfills - Landfill liners - Management of leachate and landfill gas- Landfill bioreactor - Dumpsite Rehabilitation

TOTAL: 45 PERIODS

TEXTBOOKS:

1. William A. Worrell, P. Aarne Vesilind (2012) Solid Waste Engineering, Cengage Learning, 2012.
2. John Pitchel (2014), Waste Management Practices-Municipal, Hazardous and industrial - CRC Press, Taylor and Francis, New York.

REFERENCES:

1. CPHEEO (2014), "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation, Government of India, New Delhi.
- 2 George Tchobanoglous and Frank Kreith (2002). Handbook of Solid waste management, McGraw Hill, New York.

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EN8491 WATER SUPPLY ENGINEERING

LTPC3003

UNIT I SOURCES OF WATER

9

Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.

UNIT II CONVEYANCE FROM THE SOURCE

9

Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.

UNIT III WATER TREATMENT

9

Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation – Clariflocculator-Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - Residue Management – Construction, Operation and Maintenance aspects.

UNIT IV ADVANCED WATER TREATMENT

9

Water softening – Desalination- R.O. Plant – demineralization – Adsorption - Ion exchange– Membrane Systems – RO Reject Management - Iron and Manganese removal - Defluoridation - Construction and Operation & Maintenance aspects – Recent advances - MBR process

UNIT V WATER DISTRIBUTION AND SUPPLY

9

Requirements of water distribution – Components – Selection of pipe material – Service reservoirs– Functions – Network design – Economics – Analysis of distribution networks - Computer applications – Appurtenances – Leak detection.
Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010.
3. Punmia, B.C., Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2014.

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.

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EN8592 WASTEWATER ENGINEERING

L T P C 3 0 0 3

UNIT I PLANNING AND DESIGN OF SEWERAGE SYSTEM

9

Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - sewer appurtenances - corrosion in sewers - prevention and control - sewage pumping-drainage in buildings-plumbing systems for drainage - Rain Water ting.

UNIT II PRIMARY TREATMENT OF SEWAGE

9

Objectives - Unit Operations and Processes - Selection of treatment processes - Onsite sanitation - Septic tank- Grey water harvesting - Primary treatment - Principles, functions and design of sewage treatment units - screens - grit chamber-primary sedimentation tanks - Construction, Operation and Maintenance aspects.

UNIT III SECONDARY TREATMENT OF SEWAGE

9

Objectives - Selection of Treatment Methods - Principles, Functions, - Activated Sludge Process and Extended aeration systems -Trickling filters- Sequencing Batch Reactor(SBR) - Membrane Bioreactor - UASB - Waste Stabilization Ponds - - Other treatment methods - Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects.

UNIT IV DISPOSAL OF SEWAGE

9

Standards for- Disposal - Methods - dilution - Mass balance principle - Self purification of river- Oxygen sag curve - deoxygenation and reaeration - Streeter-Phelps model - Land disposal - Sewage farming - sodium hazards - Soil dispersion system.

UNIT V SLUDGE TREATMENT AND DISPOSAL

9

Objectives - Sludge characterization - Thickening - Design of gravity thickener- Sludge digestion - Standard rate and High rate digester design- Biogas recovery - Sludge Conditioning and Dewatering - Sludge drying beds- ultimate residue disposal - recent advances.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2015.
2. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2014.
- 3, Punmia, B.C., Jain, A.K., and Jain.A.K., Environmental Engineering, Vol.II, Laxmi Publications, 2010.

REFERENCES:

1. Manual on Sewerage and Sewage Treatment Systems Part A,B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Metcalf and Eddy- Wastewater Engineering-Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2010.
3. Syed R. Qasim "Wastewater Treatment Plants", CRC Press, Washington D.C.,2010
4. Gray N.F, "Water Technology", Elsevier India Pvt. Ltd., New Delhi, 2006.

C. S. S. S.

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Tirunelveli, Tamil Nadu



CE8016 GROUNDWATER ENGINEERING

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UNIT I HYDROGEOLOGICAL PARAMETERS 9

Introduction - Water bearing Properties of Rock - Type of aquifers - Aquifer properties - permeability, specific yield, transmissivity and storage coefficient - Methods of Estimation - GEC norms - Steady state flow - Darcy's Law - Groundwater Velocity - Dupuit Forchheimer assumption - Steady Radial Flow into a Well

UNIT II WELL HYDRAULICS 9

Unsteady state flow - Theis method - Jacob method - Chow's method - Law of Times - Theis Recovery - Bailer method - Slug method - tests - Image well theory - Partial penetrations of wells - Well losses - Specific Capacity and Safe yield - Collector well and Infiltration gallery

UNIT III GROUNDWATER MANAGEMENT 9

Need for Management Model - Database for Groundwater Management - Groundwater balance study - Introduction to Mathematical model - Model Conceptualization - Initial and Boundary Condition - Calibration - Validation - Future Prediction - Sensitivity Analysis - Uncertainty - Development of a model

UNIT IV GROUNDWATER QUALITY 9

Ground water chemistry - Origin, movement and quality - Water quality standards - Drinking water - Industrial water - Irrigation water - Ground water Pollution and legislation - Environmental Regulatory requirements

UNIT V GROUNDWATER CONSERVATION 9

Artificial recharge techniques - Reclaimed wastewater recharge - Soil aquifer treatment (SAT) - Aquifer Storage and Recovery (ASR) Seawater Intrusion and Remediation - Ground water Basin management and Conjunctive use - Protection zone delineation, Contamination source inventory and remediation schemes

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

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1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.
2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 1998.

Principal

THAMIRABHARANI ENGG COLLEGE,
Tirunelveli, Tamilnadu-627 358