

**GUJARAT UNIVERSITY**

**Structure of Credit System in M.Phil. Climate Change Impacts Management**

w.e.f. 2018

Department	Semester	Course	No. of hours per week				Course credits	
			Name	Lect ure s	Other s	Pr a c t		Total
<b>B O T A N Y</b>	<b>1</b>	<b>CLI 601</b>	RESEARCH METHODOLOGY	3	1	--	4	4
		<b>CLI 602</b>	CHALLENGES OF CLIMATE CHANGE	3	1	--	4	4
		<b>CLI 603</b>	FUTURE OF CLIMATE CHANGE	3	1	--	4	
		<b>CLI 604</b>	SEMINAR, FIELD WORK & REVIEW WRITING	3	1	--	4	4
	<b>2</b>	<b>CLI 605</b>	DISSERTATION	--	--	8	8	8
		Total		12	4	8	24	24

**Department of Botany, Bioinformatics & Climate Change Impacts Management**

**Gujarat University, Ahmedabad**

**Course Structure for M.Phil. In Climate Change Impacts Management**

**CLI 601: Research Methodology**

**UNIT - 1 LABORATORY TECHNIQUES**

- Basic principles of safety in a laboratory, Health and safety: general safety, Chemicals-routine, reactive and toxic, care of handling and safety, burns in a lab and fire safety, Electric, UV and Radiation protection, Hazards- biological, Physical, chemical, precautions, disposal of chemicals and hazardous material.
- Basic laboratory procedures: distillation, drying, solvent extraction, preparing standard solutions, percent -ppm-molar solutions, buffer solutions and pH, Cleaning glassware, storing reagents, keeping stock of chemicals and glassware.
- Use and care of Laboratory instruments, equipment, microscopes, computers, printers etc.
- Making and recording measurements, SI units and their use, Scientific method-steps.

**UNIT - 2 INFORMATION TECHNOLOGY**

- Information technology and library resources: The Internet and World Wide Web, internet resources for Botany using spreadsheets. Word processors, database and other packages.
- Finding and citing information, Online tools, Research ethics: Falsification and fabrication of data, Plagiarism, IPR,
- Biological collections -The Convention on Biological Diversity,(1992), Biodiversity Act (2002), National Biodiversity Authority, guidelines for biological collections.
- Databases and their responsible use: NCBI, Biodiversity databases. Introduction, Geomatics, GIS and RS, Georeferencing, Open source GIS, Applications

**UNIT - 3 RESEARCH DESIGN**

- Research problem: meaning of research problems, sources of research problems. Criteria / characteristics of good research problem, errors in selecting a research problem ;
- Types of research: Qualitative -exploratory research and Quantitative - conclusive descriptive and casual research, Data collection-primary and secondary data, surveys and experimentation,
- Communicating information : General aspects of scientific writing, Reporting practical work, writing literature surveys and reviews, organizing a poster display, Research Report: Format of the research report, style of writing the report, references and bibliography, writing essays, Online tools meant for citation, correct usage of technical language and scientific peer network, and Presentations, print

and online journals, ISSN, ISBN, H-index, impact factor, ResearchGate, Scopus, Google Scholar, etc

- Presentation skills: Effective oral scientific communication to specialized audiences, including peer groups, as well as general audiences such as students, the general population and policy makers.

#### **UNIT - 4 STATISTICS IN RESEARCH METHODOLOGY**

- Sample and population, measures of central tendency, measures of dispersion and variability. Standard deviation, Standard error, Quality assurance and quality control, errors - types of errors, Data analysis, Distributions, summary statistics,
- Hypothesis testing: One sample, two sample, paired sample and multiple sample hypothesis. Statistical analysis. Testing of hypothesis,
- Probability- definition, various events in probability, laws, Bayes' Theorem.
- Regression and correlation: Simple linear correlation and linear regression, multiple regression, significance of p, coefficient of determination and correlation coefficient. Use of t-test, chi-square test and F-statistics, Analysis of Variance -ANOVA, use of computer in statistical analysis, SPSS, confidence limits,

#### **References**

1. Research Methodology. Methods and Techniques C. R. Kothari and Gaurav Garg, New Age Publishers
2. Research methodology and Statistical analysis by O.R.Krishnaswamy and D.Obul Reddy, Himalaya Publishing House

### **CLI 602 : Challenges of Climate Change**

#### **Unit- 1 CLIMATE CHANGE ADAPTATION**

- Definition, Types and Methods of adaptation : Anticipator, reactive, human, natural, Systems, Scales, and Actors
- Vulnerability and resilience: Concept, definition, methodology and case studies
- Adaptation measures by countries around the world, adaptation measures by India, Opposition to adaptation
- Sector –wise adaptation strategy : agriculture, forests, water resources, coastal resources, fisheries, human health; adaptation potential and challenges

#### **UNIT-2: ADAPTIVE CAPACITY**

- Adaptive Capacity: Definition, concept and issues, Determinants of adaptive capacity: Economic resources, Technology, Information and skills, Infrastructure, Equity and Institution.
- Methods of enhancing adaptive capacity in sectors: Agriculture, Forestry, coastal
- Tools to address climate risks in development activities, Disaster risk reduction-policy and plans
- Tools and approaches to incorporate vulnerability and adaptation in development projects, NAPAs, CBA, ALM, APF,SEA,CC-DARE

### **UNIT-3: MITIGATION STRATEGIES AND OPTIONS FOR VARIOUS SECTORS**

- Methodology and Structure of mitigation assessment, Improved energy efficiency, fuel substitution, hydropower, carbon capture and sequestration, land based carbon sinks
- Sector-wise measures and instruments to mitigate climate change : Short term and Long term Mitigation action
- Emission standards : Vehicle emission performance standard : CARB, EURO and Bharat Stage
- New and clean technologies initiatives in India and Gujarat.

### **UNIT-4: RENEWABLE AND ALTERNATIVE ENERGY TECHNOLOGIES**

- Technology options: Biomass, Solar, Hydro, Geothermal and Wind in India and Gujarat.
- Technology transfer, Current Transfer of Climate Change Mitigation Technology, Methodological and Technological Issues in Technology Transfer, Barriers to Technology Transfer.
- Stakeholders and pathways for energy supply technology transfer in India and Gujarat
- Case examples : Transfer of technologies between countries , Programmes and Policies for Technology Transfer between Countries.

## **Cli 603 : Future of Climate Change**

### **UNIT- 1: CARBON MARKETS**

- Emission trading , Carbon accounting, Carbon Offsets, Tradable Permits and Leakage
- Structure of international carbon market , allowance and project based markets : Chicago Climate Exchange, European Climate Exchange, European Energy Exchange, NASDAQ OMX Commodities Europe , Power Next, Commodity Exchange Bratislava,
- Pricing structures and Formulation : Fixed, Floating, Combination of the two ,Buyers and sellers of carbon assets
- Transactions and trends and Voluntary carbon market

### **UNIT- 2: GREEN ACCOUNTING**

- Need , objectives and significance of green accounting,
- Corporate Social responsibility in Gujarat, India and around the world.
- Corporate Houses-mandatory disclosure, Voluntary disclosure,
- Legal clarification-Article 51 A of Directive Principles, Constitutional provisions-acts, notifications to harmonize environmental protection and economic development.

### **UNIT- 3: SUSTAINABLE TOURISM**

- Need , objectives and significance of Sustainable Tourism for economic development and environmental protection.

- Characters, Principles and consequences of sustainable tourism, ecotourism, agritourism, Medical tourism, Religious tourism, coastal tourism, mountain tourism etc in India and world.
- Transportation, Plastics, awareness of tourists, rules and punishments, Role of Ministry of Tourism, Role of NGOs, Role of local communities as ecoclubs,
- Problems of sustainable tourism and solutions, World Travel and Tourism Council (WTTC), the World Tourism Organisation and the Earth Council, 'Agenda 21 for the Travel and Tourism Industry: Towards Environmentally Sustainable Development'.

#### **UNIT- 4: GREEN INITIATIVES**

- Paperless administration-opportunities and challenges, e-governance initiatives-problems and solutions
- Green Conventions-environmental friendly waste disposal practices, Resource and energy economization, transportation, food wastage minimization,
- Green Buildings- energy and water needs, Green buildings in Gujarat-case study
- Green travel initiatives in Gujarat, India and the world - bikes, CNG, solar powered planes, electric cars, Project Loon, Trains powered by renewable energy etc.

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#### **BOT- 604 - Seminar, Field work & Review Writing**

- 1. Seminar:** Seminar to be delivered on relevant theme.
  - 2. Field Work: Visit** to industry/National institutes and interaction with experts - Report to be submitted.
  - 3. Review:** Preparation and submission of review article based on research papers addressing a contemporary research problem.
  - 4. Professional Development Activities:** Attending National / International workshop / Symposium / Conferences or participation for oral / poster presentation, interaction with M.Sc. students for problem solving.
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#### **BOT 605 - Dissertation**

##### **Dissertation — Guidelines**

- i. Maximum Marks: 200**
- ii.** Each student has to carry out dissertation work under the supervision of a faculty of the department.
- iii.** The dissertation has to be carried out in the department.

**iv.** The topics of the dissertation can be selected from any of the three branches of Botany ie. Advanced Plant Physiology, Advanced Plant Ecology or Plant Biodiversity and its Management.

**v.** Each student has to submit a dissertation on the topic of their study comprising of

- a) An introduction on the topic along with literature survey and justification for the selection of the topic
- b) Materials and methods
- c) Results and discussion
- d) Summary
- e) References

**vi.** Each student has to give a midterm presentation of their work at the department.

**vii.** Dissertation would be examined by the supervising teacher and external examiner.

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