Faculty of Engineering & Technology
Master of Technology (M. Tech)
(W. E. F.: 2023-24)

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Name of Faculty	:	Faculty of Engineering & Technology
Name of Program	:	Master of Technology (M. Tech)
Course Code	:	1MEE06
Course Title	:	Climatology
Type of Course	:	Open Elective – I
Year of Introduction	:	2023-24

Prerequisite	:	-
Course Objective	:	To provide students with a comprehensive understanding of the Earth's climate system. It aims to explore the processes, factors, and patterns that influence weather and climate, and the methods used to study and analyze climatic data.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	To analyze and interpret climatological data using appropriate methods and techniques.
	CO2	To assess the impact of climate on natural and human systems, including ecosystems, agriculture, and society.
	CO3	To evaluate climate-related hazards and their implications for different regions and sectors
	CO4	To communicate effectively about climatological concepts, data, and research findings.
	CO5	To conduct basic climatological research and engage in interdisciplinary approaches to address climate-related problems.

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**SEE**	**CIA**	**SEE**	**CIA**	
3	2	0	4	70	30	30	20	150

Legends: ***L****-Lecture;* ***T****–Tutorial/Teacher Guided Theory Practice;* ***P*** *– Practical,* ***C*** *– Credit,* ***SEE*** *– Semester End Examination,* ***CIA*** *- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.))*

Course Content

Unit No.	Topics	Teaching Hours	Weightage	Mapping with CO
1	**Elements of Atmosphere and Physical Meteorology:** Vertical temperature and pressure profile of atmosphere, atmospheric composition, scale height, solar and terrestrial radiation, transport of matter, energy and momentum in nature, wind, type of clouds and rain formation process. Conventional observational techniques, conventional measurement of pressure, temperature, humidity, wind, precipitation, visibility, Modern Observational Techniques: LIDARS, SODARS, RADARS, CTD, ARGO, Introduction of remote sensing from space.	10	24%	CO1 CO2
2	**General Meteorology:** Thermodynamics of dry and moist air: atmospheric stability and dry adiabatic lapse rate, saturated adiabatic lapse rate, pseudo adiabatic processes and equivalent potential temperature Clausius-Clapeyron (C-C) equation. Micrometeorology: Atmospheric fluid mechanics, turbulence, surface roughness and convective boundary layer.	12	28%	CO1 CO2
3	**Satellite Meteorology:** Introduction to satellite meteorology, weather satellite and orbits, satellite images, satellite winds, Data acquisition, data processing and applications, monitoring the global environment.	8	20%	CO1 CO2
4	**Climate Change:** Elements of weather and climate modelling, Basic equation and dynamics of atmosphere, Climate variability and climate change, Global warming and climate change, Elementary idea of Global climate models, Comparison of various IPCC reports, important findings of IPCC AR5, Impacts of climate change – Global and India.	12	28%	CO3 CO4 CO5

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	**10**	**30**	**40**	**10**	**10**	**0**

NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Suggested List of Experiments/Tutorials

Sr. No.	Name of Experiment/Tutorial	Teaching Hours
1	Elements of Atmosphere	4
2	Physical Meteorology	4
3	General Meteorology	4
4	Introduction to Satellite Meteorology	4
5	Data Analysis and applications of Satellite Meteorology	4
6	Elements of weather and climate modelling	4
7	Impacts of Climate Change	4

Suggested Learning Websites

Sr. No.	Name of Website
1	https://www.ncdc.noaa.gov/
2	https://climate.nasa.gov/
3	https://www.climate.gov/
4	https://www.cpc.ncep.noaa.gov/

Reference Books

Sr. No.	Name of Reference Books
1	F. K. Lutgnes, E. J. Tarbuck, D. G. Tasa, The Atmosphere: An Introduction to Meteorology, Pearson, 11th edition.
2	J. R. Holton, An Introduction to Dynamic Meteorology, Academic Press, 4th edition, 2004.
3	K. N. Liou, An introduction to atmospheric radiation, Academic press, 2nd edition, 2002.
4	T. P. DeFelice, An Introduction to Meteorological Instrumentation and Measurement, Prentice Hall, 1st edition, 1997.
5	David G. Andrews, An introduction to atmospheric physics, Cambridge University press, 2nd Edition, 2010.
6	J. Houghton, Physics of Atmospheres, Cambridge University press, 3rd edition, 2002.
7	The Environmental Isotopes in Hydrology, I. D. Clark and P. Fritz, Lewis Publishers, Boca Raton, New York.
8	W. F. Ruddiman, Earth's climate: past and future, W.H.Freeman & Co Ltd, 2nd edition.
9	Guide to Meteorological Measurements and Methods of Observation, World Meteorological.