

COURSE INFORMATION					
Course Title	Code	Semester	L+P Hour	Credits	ECTS
<b>METHODS IN SCIENTIFIC RESEARCH</b>	<b>BTEC 550</b>	<b>1-2</b>	<b>3 + 0</b>	<b>3</b>	<b>8</b>

<b>Prerequisites</b>	NONE
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<b>Language of Instruction</b>	English
<b>Course Level</b>	MSc and PhD Degrees
<b>Course Type</b>	Compulsory
<b>Course Coordinator</b>	Asst. Prof. Mayur Tamhane
<b>Instructors</b>	Asst. Prof. Mayur Tamhane
<b>Assistants</b>	NONE
<b>Internship</b>	NONE
<b>Goals</b>	The course trains participants with the knowledge and skills of Methods used to address Scientific Research and representation of scientific contribution towards revealing real world phenomena.
<b>Content</b>	Scientific Research Methodology, Elements of Scientific Research, History of Scientific Philosophy, Guidelines for Empirical Research, Pseudoscience and Authentic Science, Steps of Scientific Method – Research, Problem, Hypothesis, Experiment, Results, Discussion and Conclusion, Writing a Research Paper – Guide, Structure of Research Paper – Title, Abstract, Introduction, Methodology, Results, Discussion, Conclusion, References, Types of Research Study Design – Experimental, Observational, Qualitative, Quantitative, Opinion-based, Semi-experimental, Descriptive, Correlational Studies, Literature Review and its significance, Data Analysis - Statistical Interpretation of raw data, Grants and Research Proposal – accessing database and submission process review

Course Learning Outcomes	Program Learning Outcomes	Teaching Methods	Assessment Methods
1) Acquires the principles of Scientific Philosophy	7,8	1	A
2) Understands structure of Research Hypothesis generation and evaluation	2,6	1,2	A

3) Knows how to conduct ethical research techniques and analysis so as to contribute to scientific knowledge including educational purpose	7,9	1,2	A,C
4) Learns the process of setting up independent research programmes through grantsmanship skills	2,3	1,2,4	A,C,D

**Teaching Methods:**

1: Lecture, 2: Question-Answer, 3: Laboratory, 4: Case-study

**Assessment Methods:**

A: Testing, B: Laboratory, C: Homework, D: Project

**COURSE CONTENT**

<b>Week</b>	<b>Topics</b>	<b>Study Materials</b>
1	Scientific Research Methodology	Textbook
2	Elements of Scientific Research	Textbook
3	History of Scientific Philosophy	Textbook
4	Guidelines for Empirical Research	Textbook
5	Pseudoscience and Authentic Science	Textbook
6	Steps of Scientific Method – Research, Problem, Hypothesis, Experiment, Results, Discussion and Conclusion - I	Textbook
7	Steps of Scientific Method – Research, Problem, Hypothesis, Experiment, Results, Discussion and Conclusion - II	Textbook
8	Writing a Research Paper – Guide, Structure of Research Paper – Title, Abstract, Introduction, Methodology, Results, Discussion, Conclusion, References - I	Textbook
9	Writing a Research Paper – Guide, Structure of Research Paper – Title, Abstract, Introduction, Methodology, Results, Discussion, Conclusion, References - II	Textbook
10	Types of Research Study Design – Experimental, Observational, Qualitative, Quantitative, Opinion-based, Semi-experimental, Descriptive, Correlational Studies	Textbook
11	Literature Review and its significance	Textbook
12	Data Analysis - Statistical Interpretation of raw data	Textbook
13	Grants and Research Proposal – accessing database and submission process review - I	Textbook
14	Grants and Research Proposal – accessing database and submission process review - II	Textbook
15	SEMINAR PRESENTATION	
16	FINAL EXAM	Textbook

<b>RECOMMENDED SOURCES</b>	
<b>Textbook</b>	1. How to Write a Research Paper – Year 2011 Shuttleworth M, Experiment-Resources
<b>Additional Resources</b>	2. Explorable website – www.explorable.com

<b>MATERIAL SHARING</b>	
<b>Documents</b>	Lecture notes are emailed to students as pdf
<b>Assignments</b>	Assignment reports are collected every other week
<b>Exams</b>	1 Final

<b>ASSESSMENT</b>		
<b>IN-TERM STUDIES</b>	<b>NUMBER</b>	<b>PERCENTAGE</b>
Assignment	6	20
Term Project	1	80
<b>Total</b>		<b>100</b>
<b>CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE</b>		50
<b>CONTRIBUTION OF IN-TERM TRAINING TO OVERALL GRADE</b>		50
<b>Total</b>		<b>100</b>

<b>COURSE CATEGORY</b>	Field Courses
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<b>COURSE'S CONTRIBUTION TO PROGRAM</b>						
No	Program Learning Outcomes	Contribution Level				
		1	2	3	4	5
1	Advanced level knowledge of mathematics, science, and bioengineering.					
2	The ability of identification and describing the engineering problems in genetics and bioengineering and proposing solution					X

	by making use of most up-to-date techniques and instruments.					
3	To have the ability of the implementation in genetics and bioengineering topics, designing experiments independently, performing experiments, collecting data, analysis of the data and interpretation of the results.					X
4	The ability of designing a biological system, operation, and process by making use of modern techniques in order to meet up with the desired requirements/products.					
5	The ability of working efficiently in interdisciplinary teams and being definitive in decision making process by taking responsibilities.					
6	The ability of producing new, original, and innovative proposals and projects by inquiring investigative, productive, and enterprising capability.					X
7	The awareness in social, legal, and economical topics with consciousness in professional and ethical responsibilities.					X
8	The ability of communicating in contemporary and present oneself efficiently in national and international social and scientific arena/platforms.					X
9	The ability of retaining the necessity of lifelong education, learning, and improvement and gain the skills to achieve this.				X	
10	The ability of perceiving the impact of bioengineering, genetics, and biotechnology products and solutions at the environmental, global and social levels.					

<b>ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION</b>			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 14x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	5	70
Mid-term examination	-	-	-
Laboratory	-	-	-
Homework	6	7	42
Project	1	40	40
Final examination	1	3	3
<b>Total Work Load</b>			197
<b>Total Work Load / 25 (h)</b>			7.88
<b>ECTS Credit of the Course</b>			8