



Year: II
Semester: I

6. Name of the Faculty: Dr Rituparna Mitra

Course Code: SET41403

7. Course : Capstone Project - III

L: 0

8. Program : B.Tech

T: 0

9. Target : 60%

P: 2

C: 1

LABORATORY COURSE FILE CONTENTS

Check list Course Outcomes Attainment

S. No.	Contents	Available (Y/N/NA)	Date of Submission	Signature of HOD
1.	Authenticated Syllabus Copy	Y	31.08.2021	
2.	Individual Time Table	Y		
3.	Students' Name List (Approved Copy)	Y		
4.	Course Plan, PO, PSO, COs, CO-PO Mapping, COA Plan, Session Plan and Periodic Monitoring	Y		
5.	Rubrics for Assessment of Laboratory Experiments	Y		
6.	Lab Manual / Lab Learning Materials a) List of Experiments (Cycle I & Cycle II) b) Detailed Procedure for Experiments & Field Applications c) Viva-Voce Questions d) Smart Lab Experiments if any	NA		
7.	Dissemination of Syllabus and Course Plan to the Students	Y		
8.	Continuous Assessment A. Laboratory Observation B. Laboratory Records C. Evaluation Sheet with Rubrics D. Slow Learners List and Remedial Measures			
9.	Course End Survey (Indirect Assessment) & Consolidation			
10.	End Term Examination A. Question Paper B. Sample Answer Scripts (Best, Average, Poor) if available C. Evaluation Sheet with Rubrics D. Slow Learners List and Remedial Measures.			
11.	Content Beyond the Syllabus (Proof)			
12.	Innovative Teaching Tools Used			
13.	Consolidated Mark Statement			



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14.	CO Attainment (Continuous Assessment + End Term)			
15.	Gap Analysis & Remedial Measures			
16.	CO - PO Attainment			
17.	Class Record (Faculty Logbook)			

Signature of HOD/ Dean

Signature of Faculty

Date:

Date:



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SET41403	Capstone Project-III	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Capstone Project I & II				
Co-requisites	--				

Syllabus Copy

Course Objectives

1. To provide design experience to the students through team work.
2. To develop an understanding of various areas involved in any project.
3. To train students with various project dealing areas like feasibility, communications, planning, design, deployment and testing.

Course Content

Unit I:

10 Lecture Hours

Planning and Control of Aerial Robotics: 2-D Quadrotor Control, 3-D Quadrotor Control, Time, Motion, and Trajectories, Motion Planning for Quadrotors, Minimum Velocity Trajectories from the Euler-Lagrange Equations, Supplementary Material: Solving for Coefficients of Minimum Jerk Trajectories, Minimum Velocity Trajectories, Linearization of Quadrotor Equations of Motion.

Unit II:

10 Lecture Hours

EV Motor Drive & HEV (Hybrid Electric Vehicle): Type of wound-field DC Motor, Torque speed characteristics, DC-DC Converter, Two quadrant DC Chopper, two quadrants zero voltage transition converter-fed dc motor drive, speed control of DC Motor, Induction Motor Drive: Three Phase Inverter Based Induction Motor Drive, Equal Area PWM, Three Phase Auxiliary resonant snubbers (ARS), Inverter Type (ZVC & ZCS), Single Phase ARS Inverter Topology, Speed Control of Induction Motor, FOC, Adaptive Control, Model Reference Adaptive Control (MARS), Sliding mode Control, Configuration of HEV (Series, Parallel, Series-parallel & Complex), Power Flow control, Examples, Power flow control in all HEV configurations, Examples of HEV system performance.

Unit III:

10 Lecture Hours

Smart Transportation System (STS): Fundamentals of ITS, Sensor Technology and data requirements of STS, services covered by STS, advanced traffic management system, Advanced Traveler Information systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control systems (AVCS),



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Advanced Public Transportation systems (APTS), Advanced Rural Transportation systems (ARTS), Regional and Project STS architecture; Concept of operations; STS Models and Evaluation Methods; Planning and human factor issues for STS, Case studies on deployment planning and system design and operation; STS and safety, STS and security, STS as a technology deployment program, research, development and business models, STS planning, STS application..



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Faculty Individual Time Table

ADAMAS UNIVERSITY, KOLKATA								
SCHOOL OF ENGINEERING AND TECHNOLOGY								
DEPARTMENT OF ELECTRICAL ENGINEERING								
Programme: B.Tech								
Course Code & Course: SET41403 & Capstone Project-III Faculty Coordinator: Dr Rituparna Mitra								
Day & Time	10.30 - 11.20	11.20 - 12.10	12.10 - 01.00	01.00 - 01.50	01.50 - 02.40	02.40 - 03.30	03.30 - 04.20	04.20 - 05.10
Monday	-	-	-	LUNCH				
Tuesday	-	-	-					
Wednesday	-							
Thursday	-	-			-			-
Friday	-	-	-		-			

Signature of HOD

Signature of Class Coordinator

Date:

Date:



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Students Name List

Roll Number	Registration Number	Name of the Student
UG/02/BTEE/2020/001	AU-2020-0004481	Saptarshi Bhattacharjee
UG/02/BTEE/2020/002	AU/2020/0004560	Arkajyoti Das

Signature of HOD/Dean

Signature of Class Coordinator

Date:

Date:



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COURSE PLAN

Target	60% (marks)
Level-1	50% (population)
Level-2	60% (population)
Level-3	70% (population)

1. Method of Evaluation

UG	PG
Continuous Assessment (50%)	Continuous Assessment (50%)
End Semester Examination (50%)	End Semester Examination (50%)

*Keep as per Program (UG/PG)

2. Passing Criteria

Scale	PG	UG
Out of 10 Point Scale	CGPA – “5.00” Min. Individual Course Grade – “C” Passing Minimum – 40	CGPA – “5.00” Min. Individual Course Grade – “C” Passing Minimum – 35

*Keep as per Program (UG/PG)

3. Pedagogy

- Direct Instruction
- Kinesthetic Learning
- Flipped Classroom
- Differentiated Instruction
- Expeditionary Learning
- Inquiry Based Learning
- Game Based Learning
- Personalized Learning

4. Topics introduced for the first time in the program through this course

- (New Experiments Introduced & Content Beyond Syllabus)

5. References:

Text Books	Web resources	Journals	Reference books
NA	NA	NA	NA

Signature of HOD/Dean

Signature of Faculty

Date:

Date:



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	C: 1

GUIDELINES TO STUDY THE SUBJECT

Instructions to Students:

1. Go through the 'Syllabus' in the LMS in order to find out the Reading List.
2. Get your schedule and try to pace your studies as close to the timeline as possible.
3. Get your on-line SmartLab videos section. Make sure you use them during this course.
4. check your LMS regularly
5. go through study material
6. check mails and announcements on blackboard
7. keep updated with the posts, assignments and examinations which shall be conducted on the blackboard
8. Be regular, so that you do not suffer in any way
9. **Cell Phones and other Electronic Communication Devices:** Cell phones and other electronic communication devices (such as Blackberries/Laptops) are not permitted in classes during Tests or the Mid/Final Examination. Such devices MUST be turned off in the class room.
10. **E-Mail and online learning tool:** Each student in the class should have an e-mail id and a pass word to access the LMS system regularly. Regularly, important information – Date of conducting class tests, guest lectures, via online learning tool. The best way to arrange meetings with us or ask specific questions is by email and prior appointment. All the assignments preferably should be uploaded on online learning tool. Various research papers/reference material will be mailed/uploaded on online learning platform time to time.
11. **Attendance:** Students are required to have minimum attendance of 75% in each subject. Students with less than said percentage shall NOT be allowed to appear in the end semester examination.

This much should be enough to get you organized and on your way to having a great semester! If you need us for anything, send your feedback through e-mail rituparna.mitra@adamasuniversity.ac.in Please use an appropriate subject line to indicate your message details.

There will no doubt be many more activities in the coming weeks. So, to keep up to date with all the latest developments, please keep visiting this website regularly.



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RELATED OUTCOMES

1. The expected outcomes of the Program are:

PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering Fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively in complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and multidisciplinary environments.
PO12	Life-Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



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2. The expected outcomes of the Specific Program are: (up to 3)

PSO1	Engage in analysis and design of various power system components and their applications in the field of Electrical Engineering.
PSO2	Apply the domain knowledge of Electrical Engineering to solve problems for development of society, and/ or pursue higher education and research.
PSO3	Engage in lifelong learning and adapt to changing professional and societal needs.

3. The expected outcomes of the Course are: (minimum 4 and maximum 6)

CO1	Interpret linear controllers' construction for the planar and three-dimensional dynamic models of the quadrotor.
CO2	Interpret battery, battery indication system for EV applications.
CO3	Illustrate about the implementation of STS components.

4. Co-Relationship Matrix

Indicate the relationships by 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)

Program Outcome s Course Outcome s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
C01	3	2	1	2	3	-	-	-	3	-	-	-	-	-	3
C02	3	2	1	2	3	-	-	-	3	-	-	-	-	-	3
C03	3	2	1	2	3	-	-	-	3	-	-	-	-	-	3
Average	3	2	1	2	3	-	-	-	3	-	-	-	-	-	3



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5. Course Outcomes Assessment Plan (COA):

Course Outcomes	Continuous Assessment* (50 Marks)		End Term Exam (50 Marks)	Total (100 Marks)
	Cycle I	Cycle II		
C01	10	NA	23	33
C02	10	15	10	35
C03	NA	15	17	32
Total	20	30	50	100

* Internal Assessment – Continuous Assessment



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OVERVIEW OF COURSE PLAN OF COURSE COVERAGE

Course Activities:

S. No.	Description	Planned			Actual			Remarks
		From	To	No. of Session	From	TO	No. of Session	
1.	Cycle I Experiments	01/09/2021	05/01/2022	6				
2.	Cycle II Experiments	19/01/2022	23/02/2022	9				

Total No. of Instructional periods available for the course: ____ Sessions

Signature of HOD/Dean

Signature of Faculty

Date:

Date:



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SESSION PLAN

Session Plan				Actual Delivery			
Exp.	Date	Topics to be Covered	CO Mapped	Exp.	Date	Topics Covered	CO Achieved
1	01/09/2021	2-D Quadrotor Control, 3-D Quadrotor Control	CO1				
2	08/09/2021	Time, Motion, and Trajectories, Motion Planning for Quadrotors	CO1				
3	15/09/2021	Minimum Velocity Trajectories from the Euler-Lagrange Equations	CO1				
4	22/09/2021	Supplementary Material: Solving for Coefficients of Minimum Jerk Trajectories	CO1				
5	29/09/2021	Minimum Velocity Trajectories, Linearization of Quadrotor Equations of Motion	CO1				
6	06/10/2021	Type of wound-field DC Motor, Torque speed characteristics	CO2				
7	20/10/2021	DC-DC Converter, Two quadrant DC Chopper, two quadrants zero voltage transition converter-fed dc motor drive, speed control of DC Motor	CO2				
8	27/10/2021	Induction Motor Drive: Three Phase Inverter Based Induction Motor Drive, Equal Area PWM	CO2				

Cycle-I



Year: II

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L: 0

T: 0

P: 2

C: 1

Remarks:

Signature of Faculty

Date:



Year: II
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9. Target : 60%

Course Code: SET41403

L: 0
T: 0
P: 2
C: 1

SESSION PLAN

Cycle-II

Session Plan				Actual Delivery			
Exp.	Date	Topics to be Covered	CO Mapped	Exp.	Date	Topics Covered	CO Achieved
1	03/11/2021	Three Phase Auxiliary resonant snubbers (ARS), Inverter Type (ZVC & ZCS)	CO2				
2	10/11/2021	Power flow control in all HEV configurations	CO2				
3	17/11/2021	Sensor Technology and data requirements of STS	CO3				
4	24/11/2021	Advanced Traveler Information systems (ATIS)	CO3				
5	01/12/2021	Advanced Public Transportation systems (APTS)	CO3				
6	08/12/2021	Advanced Rural Transportation systems (ARTS)	CO3				
7	15/12/2021	Concept of operations; STS Models	CO3				

Remarks:

Signature of Faculty

Date:



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PERIODIC MONITORING

Attainment of the Course (Learning) Outcomes:

Components	Attainment level	Action Plan	Remarks
Cycle I Continuous Assessment	CO1:	Quiz/Test on 15.11.2021	
	CO2:		
	CO3:	NA	
Cycle II Continuous Assessment	CO1:	NA	
	CO2:	Quiz/Test on 17.02.2022	
	CO3:		
End Semester	CO1:	Will held on 07.03.2022	
	CO2:		
	CO3:		
Any Other	CO1:	NA	
	CO2:		
	CO3:		
	CO4:		
	CO5:		

Signature of HOD/ Dean

Signature of Faculty

Date

Date



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Continuous Evaluation Sheet

Roll Number	Registration Number	Name of the Student	Continuous Assessment*							
			Cycle I (25)					Cycle II (25)		
			E x 1	Ex 2	E x 3	E x 4	Ex 5	E x 6	E x 7	etc .

*Depends on Number of Experiments Divide the Total Marks and Prepare Rubrics for Evaluating Experiments

Signature of HOD/Dean

Signature of Faculty

Date:

Date:



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Planning for Remedial Classes

Sl. No.	Name of Student	Roll No.	Re g. No.	Mid Sem Marks	Remedial Classes Held							Retest on the basis of Remedial Classes	End Sem Marks	Improvement (Y/N)
					Date									
					Venue									
					Time									
1.														
2.														

Signature of HOD/ Dean

Signature of Faculty

Date:

Date:



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COURSE END SURVEY

INDIRECT ASSESSMENT

Sample format for Indirect Assessment of Course outcomes:

NAME:
ROLL NO.:
REG. NO.:
COURSE:
PROGRAM:

Please rate the following aspects of course outcomes of

Use the scale 1-5 (Poor – Excellent) *

Course Outcome s	Statement	1	2	3	4	5
CO1						
CO2						
CO3						
CO4						
CO5						



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INDIRECT ASSESSMENT CONSOLIDATION

ADAMAS UNIVERSITY, KOLKATA SCHOOL OF DEPARTMENT OF CO Indirect Assessment		
Programme: Batch: 2020-22		Academic Year:2020-21
Course Code & Name:		
Course Outcome	Students Feed Back (5)	Attainment (100)
C01		
C02		
C03		
C04		
C05		
etc.		
Signature of HOD/Dean Date:		Signature of Faculty Date:



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Evaluation Sheet (End Semester)

Roll Number	Registration Number	Name of the Student	Marks (50)

Signature of HOD/Dean

Signature of Faculty

Date:

Date:



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Planning for Remedial Classes – End Semester

Sl. No.	Name of Student	Roll No.	Reg. No.	End Sem Marks	Remedial Classes Held							Retest on the basis of Remedial Classes	Supple Exam Marks	Improvement (Y/N)
					Date									
					Venue									
					Time									
1.														
2.														

Signature of HOD/ Dean

Signature of Faculty

Date

Date



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Consolidated Mark Statement

Roll Number	Registration Number	Name of the Student	Marks			
			Continuous Assessment (50)		End Semester (50)	Total (100)
			Cycle I (25)	Cycle II (25)		

Signature of Dean/HOD

Date:

Signature of Faculty

Date:



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CO ATTAINMENT – GAP ANALYSIS & REMEDIAL MEASURES

ADAMAS UNIVERSITY, KOLKATA SCHOOL OF DEPARTMENT OF CO ATTAINMENT - GAP ANALYSIS & REMEDIAL MEASURES							
Batch :	2020-22				Academic Year: 2020-21		
Course Code & Name			Name of the Coordinator			Year & Semester	
						I & I	
CO	Direct Assessment	Indirect Assessment	CO Attainment	Target	CO Attainment Gaps	Action for Bridge the Gap	Target Modification
CO1							
CO2							
CO3							
CO4							
CO5							

Signature of HOD/Dean

Signature of Faculty

Date:

Date:



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CO-PO ATTAINMENT

ADAMAS UNIVERSITY, KOLKATA SCHOOL OF DEPARTMENT OF CO-PO ATTAINMENT																	
Programme :		Year & Sem: I & I		Academic Year: 2020-21		Batch:2020-22											
Course Code	Course Name	CO-PO	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO 7	PO8	PO 9	PO 10	P O 11	PO 12	PS O 1	PSO 2	PS O 3
		Relationship															
		Mapping Value															
		Attainment															

Signature of HOD/Dean

Signature of Faculty

Date:

Date:



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PO ATTAINMENT OF THE COURSE

Signature of HOD/Dean

Date:

Signature of Faculty

Date:



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INSTRUCTIONS FOR FACULTY

Instructions for Faculty

- Faculty should keep track of the students with low attendance and counsel them regularly.
- Course coordinator will arrange to communicate the short attendance (as per University policy) cases to the students and their parents monthly.
- Experiment covered in each lab should be recorded in the table of RECORD OF CLASS TEACHING (Suggested Format).
- Internal assessment marks should be communicated to the students twice in a semester.
- The file will be audited by respective Academic Monitoring and Review Committee (AMRC) members for theory as well as for lab as per AMRC schedule.
- The faculty is required to maintain these files for a period of at least three years.
- This register should be handed over to the head of department, whenever the faculty member goes on long leave or leaves the Colleges/University.
- For labs, continuous evaluation format (break-up given in the guidelines for result preparation in the same file) should be followed.
- Department should monitor the actual execution of the components of continuous lab evaluation regularly.
- Instructor should maintain record of experiments conducted by the students in the lab weekly.
- Instructor should promote students for self-study and to make concept diary, due weightage in the internal should be given under faculty assessment for the same.
- Course outcome assessment: To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfilment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the student survey which needs to be designed by the faculty (sample format is given below) and it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement.
- **Submission Targets of Course Contents:**
 - o S. No. 1 to 7 : Before Starting the Course
 - o S. No. 8 & 9 : After Mid Semester Examination
 - o S. No. 10 to 13 : Immediately After End Semester Examination
 - o S. No. 14 to 17 : After Declaration of Result of the Course