1.2 PROGRAM GENERAL AIMS

The holder of this Master of Science Degree should be able to:

- Deal with complex issues systematically and creatively, make sound judgments in the absence of a complete data, and communicate their conclusions clearly to specialist and non-specialist audiences.
- Demonstrate self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level.
- Continue to advance their knowledge and understanding, and to develop new skills to a high level
- Have the skill to expand the awareness of energy management and low consumption systems.
- Have the independent learning ability required for continuing professional development.

1.3 INTENDED LEARNING OUTCOMES (ILOS) OF THE PROGRAM

A- Knowledge and Understanding

Students must be able to:

A1. Select and comprehensively explain scientific principles and methodology, including: electricity, circuit theory, properties of materials, fundamentals of mechanics, construction technology, and energy systems, necessary to underpin their education in Renewable Energy and Sustainable Technologies, to enable appreciation of its scientific and engineering context, and to support their awareness of developing technologies related to their specializations in Engineering fields;

A2. Select and comprehensively explain mathematical principles necessary to underpin their education in Renewable Energy and Sustainable Technologies and apply mathematical methods, tools, and notation proficiently in the analysis and solution of complex and conceptually challenging engineering problems;

A3. Apply mathematical and computer models relevant to the engineering disciplines and evaluate their limitations;

A4. Extend knowledge and understanding of other engineering disciplines such as electrical systems engineering or power engineering to support study in Renewable Energy and Sustainable Technologies;

A5. Understand concepts from outside Renewable Energy and Sustainable Technologies and to apply them effectively in engineering projects.
A6. Be familiar with the local, regional and international legislation, protocols, memorandum of understandings and agreements those related to fuel, energy, emissions and environment protection.

B- Intellectual / Cognitive Skills

Students must be able to:

B1. Make informed judgments by critically evaluating fundamental engineering principles to investigate new and emerging technologies;
B2. Identify, classify, and synthesis the performance of systems and components through the use of analytical methods and modeling techniques;
B3. Apply mathematical and computer-based models for solving problems in engineering, and assess the limitations of particular cases;
B4. Extract data pertinent to an unfamiliar problem and apply in its solution using computer-based engineering tools when appropriate.

C- Practical Skills

Students must be able to:

C1. Define and deal with complex and conceptually challenging problems and evaluate constraints including environmental and sustainability limitations, health and safety and risk assessment issues;
C2. Define and evaluate customer and user needs and the importance of considerations such as aesthetics;
C3. Take full responsibility for initiating, identifying, and amending cost drivers;
C4. Use creativity systematically to establish innovative solution;
C5. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;
C6. Extend knowledge and understanding of design processes and methodologies, apply and adapt them in unfamiliar situations;
C7. Generate an innovative design for products, systems, components, or processes to fulfill new needs.

C8. Thoroughly understand current practice and its limitations, and some appreciation of likely new developments as well as select, use, and evaluate appropriateness of a wide range of engineering materials and components;
C9. Operate safely in a workshop or laboratory environment while using a range of tools and techniques;
C10. Apply engineering techniques taking into account a range of commercial and industrial constraints;
C11. Draw heavily on current research and academic publications to collect and evaluate technical literature and other information sources;
C12. Appreciate the nature of intellectual property and contractual issues;
C13. Manage quality issues;
C14. Work with technical uncertainty.

D- Transferable Skills

Students must be able to:

D1. Interpret commercial and economic context of engineering processes;
D2. Extend knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately;
D3. Recognize the requirement for engineering activities to promote sustainable development;
D4. Extend awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
D5. Apply high level of professional and ethical conduct in engineering at all time;
D6. Make general evaluations of commercial risks through some understanding of the basis of such risks
D7. Manage tasks, resources and team work effectively.
D8. Enhance lifelong learning capabilities.

1.4 Courses and Intended Learning outcomes (ILOs) Cross Mapping:

SMART CONTROL SYSTEMS FOR ENERGY MANAGEMENT MASTERS

Courses/ILOs	A						B				C														D							
	1	2	3	4	5	6	1	2	3	4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8
Core Courses																																
Energy Optimization Algorithm																																
Digital Measurments	✓				✓		✓												✓													
Thermal Energy Systems		✓	✓	✓	✓		✓	✓	✓	✓	✓						✓															
ISO 5001-Energy Systems	✓					✓		✓		✓			✓					✓	✓	✓			✓		✓	✓					✓	✓
Green Computing				✓	✓	✓	✓			✓	✓	✓		✓		✓	✓								✓			✓				✓
Elective Package - 1 The Management and Control Systems																																
Fault Tolerance Control For Smart Systems																																
Smart Grids For Energy Saving	✓	✓		✓	✓		✓						✓	✓		✓									✓	✓						✓
Modelling and Simulation			✓				✓	✓	✓	✓				✓		✓	✓	✓													✓	✓
Intelligent & Autonomous System	✓	✓	✓	✓			✓	✓	✓	✓				✓	✓	✓	✓			✓				✓			✓					✓
Robotics Modelling and Control					✓			✓	✓	✓							✓		✓													
Energy Quality Systems	✓			✓	✓		✓	✓			✓				✓								✓				✓	✓			✓	✓
Smart Facility Planning Systems	✓	✓	✓	✓	✓		✓			✓		✓	✓	✓												✓	✓					✓
Green Cloud Computing				✓										✓		✓	✓		✓	✓									✓		✓	
Operation Research		✓	✓						✓	✓				✓		✓	✓	✓			✓	✓		✓					✓	✓		
Real-time Hardware Setups	✓	✓	✓	✓				✓	✓	✓						✓	✓			✓							✓				✓	✓
Elective Package - 2 The Automated Industrial Systems																																
Waste Heat Recovery	✓		✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓		✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		
Low Cost Automated Systems			✓					✓	✓				✓	✓			✓	✓	✓												✓	✓
New Technologies in HVAC Syster	✓		✓	✓		✓		✓	✓			✓		✓			✓			✓			✓		✓			✓		✓		
Building Management Systems	✓	✓	✓				✓	✓		✓	✓			✓	✓			✓	✓	✓			✓	✓	✓		✓	✓		✓		
Industrial Project Management	✓	✓	✓	✓	✓		✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓			
Machine Design	✓		✓						✓	✓	✓			✓	✓	✓	✓											✓			✓	✓
Advanced and Smart Materials	✓			✓			✓	✓						✓			✓	✓									✓				✓	
Renewable Energy Resourses	✓			✓	✓			✓	✓		✓					✓	✓			✓											✓	✓
Industrial Robotics Power Systems				✓		✓		✓	✓	✓	✓			✓			✓			✓												
Power Station System Design	✓	✓		✓	✓			✓	✓						✓			✓										✓				✓