ANNEX 2 – COURSE DESCRIPTION

<table>
<tr><td>Course Title</td><td colspan="5">Thermodynamics I</td></tr>
<tr><td>Course Code</td><td colspan="5">ME200</td></tr>
<tr><td>Course Type</td><td colspan="5">Compulsory</td></tr>
<tr><td>Level</td><td colspan="5">BSc (Level 1)</td></tr>
<tr><td>Year / Semester</td><td colspan="5">2^{nd} Year / 3^{th} Semester</td></tr>
<tr><td>Teacher's Name</td><td colspan="5">Dr. George Karagiorgis</td></tr>
<tr><td>ECTS</td><td>5</td><td>Lectures / week</td><td>3</td><td>Laboratories/week</td><td>1</td></tr>
<tr><td>Course Purpose</td><td colspan="5">The course purpose is to provide students with the necessary fundamental knowledge in the field of Thermodynamics, introduce them to the laws of thermodynamics and the thermodynamic properties related to these laws. The course will introduce system and control volume modelling and lay the groundwork for subsequent studies in fluid mechanics and heat transfer, and also prepare the student to effectively use thermodynamics in power and refrigeration cycles. Upon completion of this course, the students will be able to develop skills on analysing thermodynamic systems. The combination of theoretical knowledge and practical applications will enable students to comprehend better the whole concept.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="5">By the end of the course, students must be able to:
1. Thermodynamic system, control volume concept, units of measurement, energy, work, heat, property of pure substances. Definition of the concepts of Work, Heat and the system, and the thermodynamic relationship between them. Define the state of a working fluid and use it on PV or TS diagrams. Use of property tables
2. Use basic thermodynamic equations to solve problems related to work and heat. Calculate the properties of pure substances. Define continuity equation and use it to calculate mass flow rate, velocities, surface area, specific volume or density for a given situation
3. Explain the concept of energy. Define Internal Energy Define enthalpy. Analyse conservation of Energy. Define the steady flow energy equation and make use of it to calculate thermodynamic quantities. Analyse Thermodynamic cycles. Power cycles, Refrigeration and Heat Pump cycles. Energy Balance for Closed Systems
4. Define and analyse the second law of Thermodynamics. Define the concept of Entropy and make use of it. Make use of T-S diagrams and H-S (both vapour and perfect gas) constant pressure and constant volume lines
5. Analyse describe and use Reversible isothermal process, Reversible adiabatic, polytropic, Entropy and Irreversibility
6. Analyse maximum performance measures for Power, Refrigeration, and Heat Pump. Cycles operating between two reservoirs. The Carnot cycle.</td></tr>
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	7. Solve problems related with Power cycles. Describe, explain and use the Carnot cycle Constant Pressure cycle, Otto cycle, Diesel cycle and make use of it to calculate thermodynamic quantities. Describe / use steam cycles. Rankine cycle, Rankine with superheat, Reheat cycle, Regenerative and use the knowledge to calculate thermodynamic quantities 8. Use Combustion equations to calculate stoichiometric A/F ratio, mixture strength, oxygen content etc

Prerequisites	AMAT122	Corequisites	None

Course Content	• Fundamentals of engineering thermodynamics: thermodynamic system, control volume concept, units of measurement, energy, work, heat, property of pure substances. • The first law of thermodynamics: forms of energy, conservation of energy, thermodynamic properties, conservation of mass and the first law applied to a control volume, the steady-state steady-flow process, the uniform-state uniform-flow process. • The second law of thermodynamics: the Carnot cycle, the thermodynamic property entropy, the *T-s* and *h-s* diagram, reversible and irreversible processes, efficiency. • Heat Engine Cycles: Carnot, Otto cycle, diesel cycle, constant pressure cycle. • Combustion Equations, Stoichiometric air – fuel ratio, calorific values of fuels. • Steam Cycles: Rankine cycle, Rankine with superheat, Reheat cycle, Regenerative. Laboratory Work: Individual or small group experiments performed with the use of common vehicle Engines under certain loading conditions will be investigated. These results will be compared with engines manufacturer specifications
Teaching Methodology	The course is delivered to the students by means of lectures, conducted with the help of computer presentations. Lecture notes and presentations are available through the e-learning platform for students to use in combination with the textbooks. Furthermore theoretical principles are explained by means of demonstration examples and solution of specific problems. Lectures are supplemented with laboratory work carried out with the supervision of a lab assistant.
Bibliography	1. Advanced Thermodynamics Engineering. Kalyan Annamalai, Ishwar Kanwar Puri, CRC Press, 2001 2. Applied Thermodynamics for Engineering Technologists. T.D. Eastop and A. McConkey, Longman, 1997. 3. Fundamentals of Engineering Thermodynamics. M. Moran and H. Shapiro, Wiley & Sons, 4th Edition, 2000. 4. Fundamentals of Thermodynamics. Sonntag, Borgnakke, & van Wylen; John Wiley & Sons, 6th Edition, 2002. 5. Thermodynamics and Heat Power. Cranet Bluestein, Prentice Hall, 6th Edition, 2000. 6. Thermodynamics: An Engineering Approach. Yunus A. Cengel,

	Michael A. Boles, McGraw Hill College Div., 4th edition, 2001. 7. Advanced Engineering Thermodynamics. Adrian Bejan, Wiley-Interscience, 2nd edition, 1997
Assessment	• Assignments 10% • Laboratories 10% • Tests 20% • Final Exam 60%
Language	English