Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2021-2022

Course Handout Part II

Date:15-01-2022

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the courses.

Mechatronics design approaches, interfacing, instrumentation and control systems, modeling of mechanical and electromechanical systems, sensors and actuators, introduction to automation, pneumatics and hydraulics in automation, pneumatic circuits for automation, PLC programming and interfacing with pneumatic and hydraulic systems, introduction to MEMS, modeling and simulation of MEMS, CNC machines, automated material handling, introduction to FMS.

Course No.: **MF F485**
Course Title: **SUSTAINABLE MANUFACTURING**
Instructor-in-charge: **Dr. Kundan Singh**

Scope and Objective of the Course: Sustainable manufacturing is related with the manufacturing of parts with minimal environment impact by reducing the energy requirement and conserving the natural resources. This course will give insight to uses of environmental friendly advanced material for sustainable manufacturing. Sustainable design concept for sustainable manufacturing will also be taught. Different manufacturing processes which uses the eco-friendly methods for producing the sustainable product will be introduced in the class. A multi-disciplinary approach will be undertaken. Collection and analysis of sustainable practices from various industries will also be discussed.

Text Books

1. D. Dornfeld (ed.), Green Manufacturing: Fundamentals and

Applications, Springer, New York, 2013 [1]

2. Anthony Johnson, Sustainability in Engineering Design, Elsevier publication, 2014 [2]

3. Gunther Seliger (ed.), Sustainability in Manufacturing, Springer, 2007 [3]

Reference Books

1. Wen LI(ed), Efficiency of manufacturing process: Energy and Ecological perspective, Springer, Australia, 2015.

2. David T Allen & David R Shonnard, Sustainable engineering, Pearson, India, 2015.

3. J Paulo Davim, Sustainable Manufacturing, Wiley, UK, 2010

4. Rob Thompson, Sustainable Materials, process and production, Thames & Hudson, 2013

Course Plan:

Lecture No.	Learning Objectives	Topic to be covered	Chapter in the text book
1-4	Fundamentals of sustainability	Sustainability importance, Sustainability challenges, Triple bottom line of sustainability and draw-back, 4Rs of sustainability, Sustainable engineering to Sustainable manufacturing,	Class notes and [1]-1
5-8	Life cycle analysis (LCA)	why LCA?, LCA methodology, LCA tools, Examples for LCA	[3]-3
9-13	Sustainable engineering design	Sustainable design for sustainable manufacturing, Taguchi analogy, Close loop material cycle, Total design control, SED whole life model,	Class notes and [2]-3

		Sustainable design constraint, Smart factories	
14-18	Measurement of sustainability	Metrics used for sustainable manufacturing, Sustainable Measurement Using Carbon Dioxide, Energy parameters, Sustainable Life Value Model	Class notes and[2]-6
19-26	Manufacturing process assessment for sustainability	Assessment of micro and macro manufacturing process, Energy requirement for micro-manufacturing process for various products	Class notes and[1]-1
27-34	Machine tool and cutting tool sustainability analysis	Machine tool and cutting tool reliability analysis methodologies, Bernstein distribution, Cutting tool wear role in sustainability	class notes and [1]-2
35-38	Manufacturing process condition analysis	Effect of workpiece condition, Role of lubrication and MQL in SM, Analysis of process stability for SM	[1]-3
39-42	Case studies	Different case studies on practice of sustainable manufacturing in industries	Class notes

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Evaluation Scheme

Component	Duration	Weightage(%)	Date & Time	Nature of Component
Mid Sem. Test	90 Min.	30	16/03 11.00am to12.30pm	Partially Open (20%) & Close Book (80%)
Quiz	–	20	-	Close Book
Project/case study	–	15	-	Open Book
Comprehension examination	2 Hrs.	35	19/05 AN	Partially Open (20%) & Close Book (80%)

Chamber Consultation Hour: Will be decided based on Time table and avail- ability of the students.

Notices: All notices will be put up on CMS only.

Make-up Policy: Make-up will be given with prior concern and genuine r easons only.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE