



**FIRST SEMESTER 2022-2023**

Course Handout Part II

Date: 29-08-2022

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

Course No. : **BITS F431**  
Course Title : **Flexible Manufacturing System**  
Instructor-in-Charge : Dr. Abhishek Sarkar  
Instructors : Dr. Abhishek Sarkar (L,P), Ahsan Ul Haq (P)

**Scope and Objective of the course:**

Introduction CAD/CAM systems, overview of FMS, system hardware and general functions, material handling system, work holding systems, cutting tools and tool management, physical planning of system, software structure functions and description, cleaning and automated inspection, communications and computer networks for manufacturing, quantification of flexibility, human factors in manufacturing, FMS and CIM in action (case studies), justification of FMS, modeling for design, planning and operation of FMS.

**Scope and Objective of the course:**

The purpose of this course is to provide introductory as well as thorough knowledge on flexible manufacturing systems. Beside detailed discussion on different components of the FMS, CAD-CAM, Robot kinematics, NC Control, emphasis will be given also to mathematical modeling, flexibility index, etc. The topics are aimed at building up a professional career in the field of flexible manufacturing systems.

**Text Book:**

(T) Shivanand et al., [\*Flexible Manufacturing System\*](#), New Age International.

**Reference Books:**

- (R1) P Radhakrishnan et al., [\*CAD/CAM/CIM\*](#), New Age International Pvt Ltd; 4th edition, 2018.  
(R2) Chang, Wysk & Wang, [\*Computer Aided Manufacturing\*](#), Pearson Education.  
(R3) Y Koren, [\*Computer Control of Manufacturing System\*](#), McGraw Hill Education; 1st edition, 2017.  
(R4) N Viswanadham & Y Narahari, [\*Performance Modeling of Automated Manufacturing System\*](#), PHI.  
(R5) B S Nagendra Parashar, [\*Cellular Manufacturing System\*](#), PHI.  
(R6) Mikell P. Groover, [\*Automation, Production Systems, and Computer-Integrated Manufacturing\*](#), Pearson Education; 4th edition, 2016.

**Course Plan:**

Lecturer No.	Learning Objectives	Topics to be covered	Chapter in the Text Book
1-2	Introduction to FMS and some of its components	<b>Flexible Manufacturing Cell, Subsystems of FMS</b>	[T:1, 2], [R1:19], [R6:16]
3-4	Material Handling System	<b>Material Handling Systems (AGV), AS/RS</b>	Class note, [R6:11]
5-6	Tool Management	<b>Tool Requirement Planning Tool Room Service Cutting Tool and Tool Management</b>	Class note, [T:9]

7-10	Computer Aided Design	<b>Transformation Design of Curved Shapes, Surface Modeling, Solid Modeling, Drawing Interchange Files,</b>	[R1:6, 17], [R2:4,5], [R3:5]
11-15	NC Machines	<b>Operation of a CNC, Machining Centers, Part Programming DDA Integrator</b>	[R1:12], [T:5], [R3:3]
16-20	Robotics	<b>Industrial Robotics, DH Parameters, Robot Kinematics, Calibration</b>	Class note [T:8]
21-23	Control for Manufacturing	<b>Control loops for NC System, Computerized Numerical Control, Adaptive Control</b>	[R3:6,7,8]
24-26	Physical Planning of System	<b>Programmable Logic Controller, Ladder Program</b>	[T:10]
27-30	System Modeling	<b>DTMC CTMC</b>	[R4:3]
31-33	Quantification of flexibility	<b>Cell Formation, Evaluation of Cellular Manufacturing, Machine flexibility</b>	[R5:1,2,4], [R6:15],
35	Cleaning and automated inspection	<b>Inspection and testing, Coordinate measuring machine,</b>	[R1:14], [T:7], [R6:22] Class note
36	Communications and computer networks for manufacturing	<b>Principles of Networking,</b>	[R1:15]
37-38	Software and Human factors	<b>Software structure functions and description, Modular Software design, Human factors in manufacturing,</b>	[T:11], Class note
39-40	Justification of FMS	<b>FMS and CIM in action, Case studies, Modeling for design, planning and operation of FMS, Beyond FMS</b>	[T:12], Class note

#### Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Practical	--	20%	To be announced during classes	OB*
Quiz	--	10%	To be announced during classes	OB*
Project	--	10%	To be presented 1 week before the beginning of Comprehensive exams	OB*
Mid-sem	90 min	25%	01/11 9.00 - 10.30AM	CB*
Comprehensive-Examination	3 hrs	35%	20/12 FN	CB*

**Chamber Consultation Hour:** Thursday 5-6 pm (except holidays).

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

**Make-up Policy:** Make-up will be given with prior concern and genuine reasons 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**