Course Outline

Code	Course Title	T-P-Pj (Credit)	Prerequisite
CUCD2130	Introduction to composites	3-0-1	

Objective

- To Learn basic idea of composite material and fabrication techniques and classification

Course outcome

- Students will get familiarized with the concept, classification and application of Composite.

Evaluation Systems
As per QA cell

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Test I	20	Written Examination
	Internal Test II	20	Online (MCQ)
	Assignment		Written submission
	Experiments		Lab Work, Report
	Project		Report and Presentation
	Quiz		Surprise/Preannounced Ones
	Total		
External Examination	QA Cell	60	Written Examination
Total		100	

Course content

Module –I (7 Hours)

Introduction to polymer, Introduction to composite, Classification: Particulate composite, Classification: Fiber reinforced composite, Polymer matrix composites, Metal matrix composites, Ceramic matrix composites, Nature-made composites,
Applications: Fiber glass Applications: Fiber glass Applications: Silica Applications: Kevlor, Carbon Applications: Boron, Silicon Carbide

Module-II (6Hours)

Constituent materials for composite, Basic structural application of Composite, Advanced structural application of Composite,

Module-III(6Hours)
Multifunctional Applications of Composites, Fabrication Processes, Elements of Mechanical Behavior of Composites, Review of Basic Mechanics of Materials Equations

Book Suggested:

Note: 1 credit theory=10 hrs lecture, 1 credit practice/project=12.5 hrs lab/workshop/field work in a semester

Course Outline

Code	Course Title	T-P-Pj (Credit)	Prerequisite
CUCD2131	**Biovia - Composite materials and characterization techniques**	0-2-0	

Objective

- Learn design of a composite material and design a system using the composite.
- To test the composite and control quality.

Course outcome

- Students will get familiarized with the concept, classification and application of Composite.
- Students will be able to do part design of composites using 3DExperience Platform
- Students will be able to design a composite using Materials Studio.

The students will know how to test a composite and control quality

Evaluation Systems
As per QA cell

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Test I	30	Written Examination
	Internal Test II	20	Online (MCQ)
	Assignment	50	Written submission
	Experiments		Lab Work, Report
	Project		Report and Presentation

	Quiz		Surprise/Preannounced Ones
	Total		
External Examination	QA Cell		Written Examination
Total		100	

Course content

Module –I (25 Hours) Practice
Polymer menu
Build menu using new molecule Blends menu Synthia menu
Polymer-polymer composite
Nanoparticle-polymer composite
Inorganic composite
SEM analysis
FTIR analysis
XPS analysis
Gaussian menu
Reflex menu

Note: 1 credit theory=10 hrs lecture, 1 credit practice/project=12.5 hrs lab/workshop/field work in a semester

Course Outline

Code	Course Title	T-P-Pj (Credit)	Prerequisite
CUCD2132	CATIA-Composites Design	0-4-0	

Objective

- To Learn design of a composite material and design a system using the composite. To test the composite and control quality.

Course outcome

- Students will be able to do part design of composites using 3DExperience Platform
- Students will be able to design a composite using Materials Studio.
- The students will know how to test a composite and control quality.

Evaluation Systems

As per QA cell

Internal Examination	*Component*	*% of Marks*	*Method of Assessment*
	Internal Test I	*30*	Written Examination
	Internal Test II	*20*	Online (MCQ)
	Assignment	*50*	Written submission
	Experiments		Lab Work, Report
	Project		Report and Presentation
	Quiz		Surprise/Preannounced Ones
	Total		
External Examination	QA Cell		Written Examination
Total		*100*	

Course content

Module –I (35 Hours)Practice

Composite Part Design topics: Preliminary design, Manual Ply Creation, Zone Design, ply Management, Mirroring, Creating IML's & Solids, Analyzing Drop Off and Slicing, composite Grid Design, Grid Panel Definition, Grid Definition, Composite Grid Design, Grid Panel Definition, Grid Definition, Virtual Stacking Management, Plies Generation, Grid Ramp Support Definition, Remove Useless Ramp Supports, Swap Edge, Reroute Ply Contour, define Local Drop Off, Create Standard Contour, Define No Drop Off Area, Synchronize Stacking, Limit Plies from Panel Limits, Creating a Manufacturing Document, Synchronizing, Skin Swapping, Defining the Edge of Part, Material Excess, Producibility Flattening, Flatten Optimization, Geometry Transfer, Producibility Inspection, Fibre Direction, Unfold Entity, Splicing and Splice Zones, Darting, Exporting, Exporting Ply Data as IGES or DXF, XML Export, Drafting Standards, Creating a Ply Book, Adding Material to Plies, Stagger Origin Points, Grid Angle Cut.

Note: 1 credit theory=10 hrs lecture, 1 credit practice/project=12.5 hrs lab/workshop/field work in a semester

Course Outline

Code	Course Title	T-P-Pj (Credit)	Prerequisite
CUCD2133	Composite Product Validation; Simulia(Abaqus FEA)	0-4-0	

Objective

- Learn design of a composite material and design a system using the composite.

Course outcome

- Students will be able to do part design of composites using 3DExperience Platform
- Students will be able to design a composite using Materials Studio.

Evaluation Systems
As per QA cell

Internal Examination	*Component*	*% of Marks*	*Method of Assessment*
	Internal Test I	30	Written Examination
	Internal Test II	20	Online (MCQ)
	Assignment	50	Written submission
	Experiments		Lab Work, Report
	Project		Report and Presentation
	Quiz		Surprise/Preannounced Ones
	Total		
External Examination	QA Cell		Written Examination
Total		*100*	

Course content

Module –I (7 Hours)
Practice:

Defining a Problem
Defining anisotropic elasticity with Hookean models for combining the fiber-matrix response
Defining composite layups using Abacus/CAE
Defining discrete or layered reinforcing within an element using rebar
Membrane elements and truss elements
Achieving the correct material orientation of the layers of composite shells
Modeling sandwich composite structures
 Modelling stiffened composite panels
 Define No Drop Off Area, Synchronize Stacking, Limit Plies from Panel Limits
Modeling progressive damage and failure in composites

Modeling delamination of composite structures
Modelling low cycle fatigue of composite structures

Note: 1 credit theory=10 hrs lecture, 1 credit practice/project=12.5 hrs lab/workshop/field work in a semester

Course Outline

Code	Course Title	T-P-Pj (Credit)	Prerequisite
CUCD2134	Machineries and Technologies used for Manufacturing of Composites	2-0-0	

Objective

•   Learn machineries and lab scale method to fabricate composite.

Course outcome

•   Students will able to fabricate different type of composite by using different tool available and able to finish the raw product

Evaluation Systems
As per QA cell

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Test I	20	Written Examination
	Internal Test II	20	Online (MCQ)
	Assignment		Written submission
	Experiments		Lab Work, Report
	Project		Report and Presentation
	Quiz		Surprise/Preannounced Ones
	Total		
External Examination	QA Cell	60	Written Examination
Total		100	

Course content

Module –I (7 Hours)

Introduction

Basics of Laminates, which have layers bonded together
Sandwiches
Open Mold Processes-
Hand layup process

Module –II (7 Hours)

Spray Bag, Vacuum Bagging
Automated tape laying machine,
Pressure bag molding
Closed Mold Processes
Filament Winding
Pultrusion Processes

Module –III (7 Hours)

PMC Shaping Processes.
Application of Pultrusion Process
Comparision between open and closed mold process

Note: 1 credit theory=10 hrs lecture, 1 credit practice/project=12.5 hrs lab/workshop/field work in a semester

Course Outline

Code	Course Title	T-P-Pj (Credit)	Prerequisite
CUCD2135	Quality control and Fabrication of Composite Structure	2-2-0	

Objective

To test the composite and control quality

Course outcome

The students will know how to test a composite and control quality

Evaluation Systems
As per QA cell

Internal Examination	*Component*	*% of Marks*	*Method of Assessment*
	Internal Test I	*20*	Written Examination
	Internal Test II	*20*	Online (MCQ)

	Assignment		Written submission
	Experiments		Lab Work, Report
	Project		Report and Presentation
	Quiz		Surprise/Preannounced Ones
	Total		
External Examination	*QA Cell*	*60*	Written Examination
Total		*100*	

Course content

Module –I (7 Hours)
Monitoring material property variations over time
Define minimum standards for aerospace grade fiber, resin, fabric/braid
Define minimum standards for aerospace prepreg – Material qualification, material specification, process control document
Factors affecting Quality of Composites made by hand lay-up

Module –II (7 Hours)

Factors affecting fabrication factors, stacking sequence, fiber volume fraction, cure
Material selection criteria for new generation aircraft
Structural Requirements for Certification,
Material Qualification Procedures, Material Property Development
Material Screening and Selection,
Material and Process Specification Development

Module –III (7 Hours)

Material and Process Control, QCs for Composite Part Manufacturing, Material Acceptance
Mechanical test of laminates and sandwiches
Test for adhesives and sealants
Chemical and physical tests for material composition
Thermal analysis for composite materials

Module –IV (7 Hours)

Aging tests by chemical aging
Thermal and humidity aging
Radiation aging test

Reappear test, fire and smoke test

Non destructive test, Ultrasonic Phased Array test,2D X-Ray test on field

Practice
- Fabrication using Natural Fibre
- Fabrication using glass fiber
- Fabrication using carbon fiber
- Fabrication processes for polymer matrix composites (PMC)
- Matched Die mold
- Contact Mould, Filament Winding,
- Pultrusion
- Fabrication processes for metal matrix composites (MMC),
- Diffusion Bonding, Powder Metallurgy Process, Casting
- Fabrication processes for ceramic matrix composites (CMC
- Hot Press Sintering, Liquid Infiltration
- Sintering, Chemical Vapour Deposition Process

Note: 1 credit theory=10 hrs lecture, 1 credit practice/project=12.5 hrs lab/workshop/field work in a semester

Course Outline

Code	Course Title	T-P-Pj (Credit)	Prerequisite
CUCD2136	Project	0-0-6	

Go To Market(End to End Product Design, Simulation &Validation: will go through Gate process)