JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (HEAT POWER REFRIGERATION AND AIR-CONDITIONI NG)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	Hours per week			Credits
				L	T	P	
		Semester-I					
1.	21D31101	Advanced Refrigeration	PC	3	0	0	3
2.	21D31102	Advanced Thermodynamics	PC	3	0	0	3
3.	21D31103a 21D31103b 21D31103c	**Program Elective Course - I** a. Conduction and Radiation Heat Transfer b. Design Optimization c. Food Preservation Techniques	PE	3	0	0	3
4.	21D31104a 21D31104b 21D31104c	**Program Elective Course – II** a. Principles of Air Conditioning b. Cryogenic Engineering c. Solar Refrigeration and Air Conditioning	PE	3	0	0	3
5.	21D31105	Refrigeration Laboratory	PC	0	0	4	2
6.	21D31106	Heat Transfer Laboratory	PC	0	0	4	2
7.	21D11107	Research Methodology and IPR	MC	2	0	0	2
8.	21D11108a 21D11108b 21D11108c	Audit Course – I 1. English for Research Paper Writing 2. Value Education 3. Pedagogy Studies	AC	2	0	0	0
Total							**18**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (HEAT POWER REFRIGERATION AND AIR-CONDITIONI NG)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	21D31201	Design of Air-Conditioning Systems	PC	3	0	0	3
2.	21D31203	Convective Heat and Mass Transfer	PC	3	0	0	3
3.	21D31203a 21D31203b 21D31203c	**Program Elective Course – III** a. Refrigeration Equipments & Control b. Design of Heat Transfer Equipment c. Advanced Thermal Storage Technologies	PE	3	0	0	3
4.	21D31204a 21D31204b 21D31204c	**Program Elective Course – IV** a. Advanced Fluid Mechanics b. Design of HVAC Systems c. Energy Conservation and Management	PE	3	0	0	3
5.	21D31205	Air-Conditioning Laboratory	PC	0	0	4	2
6.	21D31206	Advanced Fluid Mechanics Lab	PC	0	0	4	2
7.	21D31207	Technical Seminar	PR	0	0	4	2
8.	21D11208a 21D11208b 21D11208c	Audit Course – II 1. Disaster Management 2. Constitution of India 3.Stress Management by Yoga	AC	2	0	0	0
		Total					18

(Table title: Semester-II)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (HEAT POWER REFRIGERATION AND AIR-CONDITIONI NG)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	Hours per week			Credits
		Semester-III		L	T	P	
1.	21D31301a 21D31301b 21D31301c	**Program Elective Course – V** a. Design of Air Handling Systems b. Indoor Air Quality Control c. Cogeneration and Waste Heat Recovery Systems	PE	3	0	0	3
2.	**21D30301**	**Open Elective:** Mechatronics	OE	3	0	0	3
3.	21D31302	Dissertation Phase – I	PR	0	0	20	10
4.	21D31303	Co-curricular Activities					2
		Total					**18**

S.No.	Course Code	Course Name	Category	Hours per week			Credits
		Semester-IV		L	T	P	
1.	21D31401	Dissertation Phase – II	PR	0	0	32	16
		Total					**16**

Open Elective
1. Mechatronics

Open Elective:
There shall be One Open Elective in III Semester. The respective boards have to give One subject under open elective category. The students have to choose an elective offered by any department. However, the student shall not select the subject which is already studied or to be studied during the course.

Audit course I:
1. English for Research Paper Writing
2. Value Education
3. Pedagogy Studies

Audit course II:
1. Disaster Management
2. Constitution of India
3. Stress Management by Yoga

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (ADVANCED I.C. ENGINES)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	Hours per week L	T	P	Credits
		Semester-I					
1.	21D33101	Advanced Thermodynamics	PC	3	0	0	3
2.	21D33102	Advanced Heat & Mass Transfer	PC	3	0	0	3
3.	21D33103a 21D33103b 21D33103c	**Program Elective Course - I** a. Combustion and Emission in Engines. b. Engine auxiliary systems c. Electronic Engine Management System	PE	3	0	0	3
4.	21D33104a 21D33104b 21D33104c	**Program Elective Course – II** a. Alternative fuels for I.C.Engines b. Theory of fuels & Lubricants c. Advanced Fluid Mechanics	PE	3	0	0	3
5.	21D33105	Performance Testing of Internal Combustion Engines Laboratory	PC	0	0	4	2
6.	21D33106	Advanced Heat Transfer Laboratory	PC	0	0	4	2
7.	21D11107	Research Methodology and IPR	MC	2	0	0	2
8.	21D11108a 21D11108b 21D11108c	Audit Course – I 1. English for Research Paper Writing 2. Value Education 3. Pedagogy Studies	AC	2	0	0	0
		Total					18

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (ADVANCED I.C. ENGINES)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	Hours per week L	T	P	Credits
		Semester-II					
1.	21D33201	Internal combustion Engine Design.	PC	3	0	0	3
2.	21D33202	Engine pollution and control	PC	3	0	0	3
3.	21D33203a 21D33203b 21D33203c	**Program Elective Course – III** a. Hybrid and Electric vehicles b. Autotronics and vehicle intelligence	PE	3	0	0	3
4.	21D33204a 21D33204b 21D33204c	**Program Elective Course – IV** a. Computational Fluid Dynamics for Thermal Systems b. Automotive safety c. Supercharging and Scavenging	PE	3	0	0	3
5.	21D33205	Testing of combustion & Emission of IC Engines Laboratory	PC	0	0	4	2
6.	21D33206	Engine Design Laboratory	PC	0	0	4	2
7.	21D33207	Technical Seminar	PR	0	0	4	2
8.	21D11208a 21D11208b 21D11208c	Audit Course – II 1. Disaster Management 2. Constitution of India 3. Stress Management by Yoga	AC	2	0	0	0
		Total					18

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (ADVANCED I.C. ENGINES)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	L	T	P	Credits
		Semester-III					
1.	21D33301a 21D33301b 21D33301c	**Program Elective Course –V** a. Fuel cell technology b. Specialty Engines c. Environmental Engineering and Pollution control	PE	3	0	0	3
2.	**21D30301**	**Open Elective** Mechatronics	OE	3	0	0	3
3.	21D33302	Dissertation Phase – I	PR	0	0	20	10
4.	21D33303	Co-curricular Activities					2
		Total					**18**

S.No.	Course Code	Course Name	Category	L	T	P	Credits
		Semester-IV					
1.	21D33401	Dissertation Phase – II	PR	0	0	32	16
		Total					**16**

Open Elective
1. Mechatronics

Open Elective:
There shall be One Open Elective in III Semester. The respective boards have to give One subject under open elective category. The students have to choose an elective offered by any department. However, the student shall not select the subject which is already studied or to be studied during the course.

Audit course I:
1. English for Research Paper Writing
2. Value Education
3. Pedagogy Studies

Audit course II:

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (Advanced Manufacturing Systems)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	Hours per week L	T	P	Credits
		Semester-I					
1.	21D35101	Automation in Manufacturing	PC	3	0	0	3
2.	21D35102	Computer Aided Manufacturing	PC	3	0	0	3
3.	21D35103a 21D35103b 21D35103c	**Program Elective Course - I** a. Precision Engineering b. Special manufacturing Processes c. Product Data Management	PE	3	0	0	3
4.	21D35104a 21D35104b 21D35104c	**Program Elective Course – II** a. Design for Manufacturing and Assembly b. Advanced CAD c. Advanced Mechatronics	PE	3	0	0	3
5.	21D35105	Automation Laboratory	PC	0	0	4	2
6.	21D35106	Metal Cutting Laboratory	PC	0	0	4	2
7.	21D11107	Research Methodology and IPR	MC	2	0	0	2
8.	21D11108a 21D11108b 21D11108c	Audit Course – I 1. English for Research Paper Writing 2. Value Education 3. Pedagogy Studies	AC	2	0	0	0
		Total					18

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (Advanced Manufacturing Systems)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	L	T	P	Credits
		Semester-II					
				Hours per week			
1.	21D35201	Simulation of Manufacturing Systems	PC	3	0	0	3
2.	21D35202	Quality Engineering in Manufacturing	PC	3	0	0	3
3.	21D35203a 21D35203b 21D35203c	**Program Elective Course – III** a. Material Science & Technology b. Industrial Robotics c. Advanced Tool Design	PE	3	0	0	3
4.	21D35204a 21D35204b 21D35204c	**Program Elective Course – IV** a. Production & Operations Management b. Modeling of Manufacturing Systems c. Optimization Techniques	PE	3	0	0	3
5.	21D35205	Manufacturing Simulation Laboratory	PC	0	0	4	2
6.	21D35206	Advanced CAD/CAM Laboratory	PC	0	0	4	2
7.	21D35207	Technical Seminar	PR	0	0	4	2
8.	21D11208a 21D11208b 21D11208c	Audit Course – II 1. Disaster Management 2. Constitution of India 3. Stress Management by Yoga	AC	2	0	0	0

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (Advanced Manufacturing Systems)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

Total	18

Semester-III

S.No.	Course Code	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	21D35301a 21D35301b 21D35301c	Program Elective Course – V a. Total Quality Management b. Theory of Elasticity and Plasticity c. Design and Manufacturing of MEMS and Micro Systems	PE	3	0	0	3
2.	21D30301	Open Elective 1. Mechatronics	OE	3	0	0	3
3.	21D35302	Dissertation Phase – I	PR	0	0	20	10
4.	21D35303	Co-curricular Activities					2
		Total					18

Semester-IV

S.No.	Course Code	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	21D35401	Dissertation Phase – II	PR	0	0	32	16
		Total					16

Open Elective
2. Mechatronics

Open Elective:
There shall be One Open Elective in III Semester. The respective boards have to give One subject under open elective category. The students have to choose an elective offered by any department. However, the student shall not select the subject which is already studied or to be studied during the course.

Audit course I:
1. English for Research Paper Writing

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (ENERGY SYSTEMS)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S. No	Course Code	Course Name	Category	Hours per L	T	P	Credits
		Semester-I					
1	21D32101	Conduction and Radiation Heat Transfer	PC	3	0	0	3
2	21D32102	Renewable Energy Sources	PC	3	0	0	3
3	21D32103a 21D32103b 21D32103c	**Program Elective Course - I** a. Energy Management b.Direct Energy Conversion Systems c.Applied Solar Energy Engineering	PE	3	0	0	3
4	21D32104a 21D32104b 21D32104c	**Program Elective Course – II** a.Reliability & Safety Engineering b.Data Acquisition and Processing System c.Design of Heat Transfer Equipment	PE	3	0	0	3
5	21D32105	**Core Lab - I** Energy Utilization Laboratory	PC	0	0	4	2
6	21D32106	**Core Lab – II** Thermal Energy Laboratory	PC	0	0	4	2
7	21D11107	Research Methodology and IPR	MC	2	0	0	2
8	21D11108a 21D11108b 21D11108c	Audit Course – I 1. English for Research Paper Writing 2. Value Education 3. Pedagogy Studies	AC	2	0	0	0
				Total			18

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (ENERGY SYSTEMS)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S. No	Course Code	Course Name	Category	Hours per L	T	P	Credits
		Semester-II					
1	21D32201	Energy Conservation and Audit	PC	3	0	0	3
2	21D32202	Energy Efficient Electrical Systems	PC	3	0	0	3
3	21D32203a 21D32203b 21D32203c	**Program Elective Course - III** a.Waste Heat Recovery Systems b.Total Quality Management c.Solar Refrigeration & Air Conditioning	PE	3	0	0	3
4	21D32204a 21D32204b 21D32204c	**Program Elective Course – IV** a.Design of Wind Energy Systems b.Energy Resources c.Optimization of Engineering Design	PE	3	0	0	3
5	21D32205	**Core Lab - I** Energy Operations Lab	PC	0	0	4	2
6	21D32206	**Core Lab – II** Renewable Energy Systems Laboratory	PC	0	0	4	2
7	**21D32207**	Technical Seminar	**PR**	2	0	0	2
8	21D11208a 21D11208b 21D11208c	Audit Course – II 1. Disaster Management 2. Constitution of India 3.Stress Management by Yoga	AC	2	0	0	0
				Total			18

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (ENERGY SYSTEMS)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S. No	Course Code	Course Name	Category	Hours per L	Hours per T	Hours per P	Credits
		Semester-III					
1	21D32301a 21D32301b 21D32301c	**Program Elective Course – V**	PE	3	0	0	3
		a.Energy Ecology & Environment					
		b.Product Planning and Marketing					
		c.Rapid Prototyping Technologies					
2	21D30301	Open Elective 1. Mechatronics	OE	3	0	0	3
3	21D32302	Dissertation Phase – I	PR	0	0	20	10
4	21D32303	Co-Curricular Activities	PR				02
						Total	18

S. No	Course Code	Course Name	Category	Hours per L	Hours per T	Hours per P	Credits
		Semester-IV					
1	21D32401	Dissertation Phase – II	PR	0	0	32	16
						Total	16

Open Elective
2. Mechatronics

Open Elective:
There shall be One Open Elective in III Semester. The respective boards have to give One subject under open elective category. The students have to choose an elective offered by any department. However, the student shall not select the subject which is already studied or to be studied during the course.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (Product Design)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	L	T	P	Credits
		Semester-I					
1.	21D34101	Computer Aided Engineering	PC	3	0	0	3
2.	21D34102	Materials Technology	PC	3	0	0	3
3.	21D34103a 21D34103b 21D34103c	**Program Elective Course - I** A. Rapid Prototyping Technologies B. Design of Material Handling Equipments C. Mechanical Behavior of Materials	PE	3	0	0	3
4.	21D34104a 21D34104b 21D34104c	**Program Elective Course – II** A. Composite Materials and Mechanics B. Quality Concepts in Design C. Creativity and Innovations in Design	PE	3	0	0	3
5.	21D34105	Computer Aided Analysis & Design Lab	PC	0	0	4	2
6.	21D34106	Material Testing Lab	PC	0	0	4	2
7.	21D11107	Research Methodology and IPR	MC	2	0	0	2
8.	21D11108a 21D11108b 21D11108c	Audit Course – I 1. English for Research Paper Writing 2. Value Education 3. Pedagogy Studies	AC	2	0	0	0
		Total					18

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS); ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (Product Design)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	Hours per week			Credits
		Semester-II		L	T	P	
1.	21D34201	Design for Manufacturing	PC	3	0	0	3
2.	21D34202	Robust Design	PC	3	0	0	3
3.	21D34203a 21D34203b 21D34203c	**Program Elective Course – III** A. Product Planning and Marketing B. Tribology in Design C. Design of Hydraulic and Pneumatic Systems	PE	3	0	0	3
4.	21D34204a 21D34204b 21D34204c	**Program Elective Course – IV** A. Advanced Metal Forming Techniques B. Quality Concepts in Product Development C. Reverse Engineering	PE	3	0	0	3
5.	21D34205	Simulation lab	PC	0	0	4	2
6.	21D34206	Modeling and analysis Laboratory	PC	0	0	4	2
7.	21D34207	Technical Seminar	PR	0	0	4	2
8.	21D11208a 21D11208b 21D11208c	Audit Course – II 1. Disaster Management 2. Constitution of India 3.Stress Management by Yoga	AC	2	0	0	0
		Total					18

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (Product Design)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	L	T	P	Credits
		Semester-III		Hours per week			Credits
1.	21D34301a 21D34301b 21D34301c	**Program Elective Course – V** A. Applied Ergonomics B. Additive Manufacturing C. Industrial Design	PE	3	0	0	3
2.	**21D30301**	Open Elective 1. Mechatronics	OE	3	0	0	3
3.	21D34302	Dissertation Phase – I	PR	0	0	20	10
4.	21D34303	Co-curricular Activities					2
		Total					18

S.No.	Course Code	Course Name	Category	L	T	P	Credits
		Semester-IV		Hours per week			Credits
1.	21D34401	Dissertation Phase – II	PR	0	0	32	16
		Total					16

Open Elective
2. Mechatronics

Open Elective:
There shall be One Open Elective in III Semester. The respective boards have to give One subject under open elective category. The students have to choose an elective offered by any department. However, the student shall not select the subject which is already studied or to be studied during the course.

Audit course I:
1. English for Research Paper Writing
2. Value Education
3. Pedagogy Studies

Audit course II:
1. Disaster Management

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (QUALITY ENGINEERING AND MANAGEMENT)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	L	T	P	Credits
		Semester-I					
				Hours per week	
1.	21D36101	Statistical Quality Control	PC	3	0	0	3
2.	21D36102	Precision Engineering	PC	3	0	0	3
3.	21D36103a 21D36103b 21D36103c	**Program Elective Course - I** a. Quality Engineering in Manufacturing b. Probability and Statistical Methods c. Dimensional Metrology & Inspection	PE	3	0	0	3
4.	21D36104a 21D36104b 21D36104c	**Program Elective Course – II** a. Supply Chain Management b. Technology Management c. Data Analysis Techniques	PE	3	0	0	3
5.	21D36105	Quality Engineering-1 Laboratory	PC	0	0	4	2
6.	21D36106	Simulation-1 Laboratory	PC	0	0	4	2
7.	21D11107	Research Methodology and IPR	MC	2	0	0	2
8.	21D11108a 21D11108b 21D11108c	Audit Course – I 1. English for Research Paper Writing 2. Value Education 3. Pedagogy Studies	AC	2	0	0	0
		Total					18

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (QUALITY ENGINEERING AND MANAGEMENT)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

S.No.	Course Code	Course Name	Category	L	T	P	Credits
		Semester-II		Hours per week			
1.	21D36201	Reliability Engineering	PC	3	0	0	3
2.	21D36202	Lean Manufacturing and Six Sigma	PC	3	0	0	3
3.	21D36203a 21D36203b 21D36203c	**Program Elective Course – III** a. Production and Operations Management b. Software Quality Management c. Industrial Safety and Hygiene	PE	3	0	0	3
4.	21D36204a 21D36204b 21D36204c	**Program Elective Course – IV** a. Optimization Techniques b. Reverse Engineering c. Decision Support Systems	PE	3	0	0	3
5.	21D36205	Quality Engineering-II Laboratory	PC	0	0	4	2
6.	21D36206	Simulation-II Laboratory	PC	0	0	4	2
7.	21D36207	Technical Seminar	PR	0	0	4	2

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING
M.Tech (QUALITY ENGINEERING AND MANAGEMENT)
(4 SEMESTER COURSE STRUCTURE AND SYLLABUS R21)

8.	21D11208a 21D11208b 21D11208c	Audit Course – II 1. Disaster Management 2. Constitution of India 3. Stress Management by Yoga	AC	2	0	0	0
		Total					**18**

Semester-III

S.No.	Course Code	Course Name	Category	Hours per week L	T	P	Credits
1.	21D36301a 21D36301b 21D36301c	**Program Elective Course – V** a. Total Quality Management b. Quality Management Systems c. Quality Concepts in Product Development	PE	3	0	0	3
2.	**21D30301**	Open Elective 1. Mechatronics	OE	3	0	0	3
3.	21D36302	Dissertation Phase – I	PR	0	0	20	10
4.	21D36303	Co-curricular Activities					2
		Total					**18**

Semester-IV

S.No.	Course Code	Course Name	Category	Hours per week L	T	P	Credits
1.	21D36401	Dissertation Phase – II	PR	0	0	32	16
		Total					**16**

Open Elective
   2. Mechatronics

Open Elective:
There shall be One Open Elective in III Semester. The respective boards have to give One subject under open elective category. The students have to choose an elective offered by any department. However, the student shall not select the subject which is already studied or to be studied during the course.

Audit course I: