Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University) **(Accredited 'A++' Grade by NAAC with a score of 3.25)**

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2021

1st to 8th Semester

(Department of Electronics Engineering

Industrial Internet of Things (IIoT)

28 June 2019

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No.
IoT-203

B.TECH SCHEME OF EXAMINATION 2021-22

(Scheme of Examination w.e.f. 2021-22 onward)

(Department of Electronics Engineering)

Industrial IOT

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
					First Semester										
1	1	BES	EL	IIOT2101	Basic Electrical Machines	T	3	0	0	3	3	30	30	40	3 Hours
2	1	BES	EL	IIOT2102	**Lab.:** Basic Electrical Machines	P	0	0	2	2	1		60	40	
3	1	HS	GE	IIOT2103	Constitution of India	T	3	0	0	3	3	30	30	40	3 Hours
4	1	BS	GE	IIOT2104	Calculus	T	3	0	0	3	3	30	30	40	3 Hours
5	1	BS	GE	IIOT2105	Semiconductor Physics	T	3	0	0	3	3	30	30	40	3 Hours
6	1	BS	GE	IIOT2106	**Lab.:** Semiconductor Physics	P	0	0	2	2	1		60	40	
7	1	PC	EE	IIOT2107	C Programming	T	3	0	0	3	3	30	30	40	3 Hours
8	1	PC	EE	IIOT2108	**Lab.:** C Programming	P	0	0	2	2	1		60	40	
9	1	BES	ME	IIOT2109	Engineering Materials	T	3	0	0	3	3	30	30	40	3 Hours
						TOTAL FIRST SEM	**18**	**0**	**6**	**24**	**21**				
List of Audit Course															
1	1	HS	GE	GE2131	Universal Human Value	**T**	2	0	0	0	0				
2	1	HS	GE	GE2123	YCCE Communication & Aptitude Preparation (YCAP)	**A**	3	0	0	3	0				
3	2	HS	GE	GE2124	YCCE Communication & Aptitude Preparation (YCAP)	**A**	3	0	0	3	0				
					Second Semester										
1	2	BS	GE	IIOT2151	Probabilty theory and Statistical Inference	T	3	0	0	3	3	30	30	40	3 Hours
2	2	BS	GE	IIOT2152	Applied Chemistry	T	3	0	0	3	3	30	30	40	3 Hours
3	2	BS	GE	IIOT2153	**Lab.:** Applied Chemistry	P	0	0	2	2	1		60	40	
4	2	BES	ME	IIOT2154	Engineering Graphics	T	3	0	0	3	3	30	30	40	3 Hours
5	2	BES	ME	IIOT2155	**Lab.:** Engineering Graphics	P	0	0	2	2	1		60	40	
6	2	HS	GE	IIOT2156	Technical Communication	T	3	0	0	3	3	30	30	40	3 Hours
7	2	PC	ME	IIOT2157	Fundamentals of Manufacturing Process	T	3	0	0	3	3	30	30	40	3 Hours
8	2	PC	ME	IIOT2158	**Lab.:** Fundamentals of Manufacturing Process	P	0	0	2	2	1		60	40	
9	2	PC	EE	IIOT2159	**Lab.:** Python Programming	P	0	0	2	2	1		60	40	
						TOTAL SECOND SEM	**15**	**0**	**8**	**23**	**19**				

MSEs* = Two MSEs of 15 Marks each will be conducted and total marks of MSE 1 and MSE 2 MSEs will be considered for Continuous Assessment out of 30.

TA- for Theory : 30 marks on quizzes, activities, attendance etc as included in TA plan of course teacher. TA - for Practical: MSPA will be 15 marks each as included in TA plan of course teacher

TA – for Practical : MSPA will be 15 marks each

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. IoT-203.1

B.TECH SCHEME OF EXAMINATION 2021-22

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electronics Engineering)

Industrial IOT

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
Third Semester															
1	3	PC	EE	IIOT2201	Digital Electronics	T	3	0	0	3	3	30	20	50	3 Hours
2	3	PC	EE	IIOT2202	**Lab. :** Digital Electronics	P	0	0	2	2	1		60	40	
3	3	BS	GE	IIOT2203	Linear Algebra and Graph Theory	T	3	0	0	3	3	30	20	50	3 Hours
4	3	PC	EE	IIOT2204	Electronics Deivces and Circuits	T	3	0	0	3	3	30	20	50	3 Hours
5	3	PC	EE	IIOT2205	**Lab.:** Electronics Deivces and Circuits	P	0	0	2	2	1		60	40	
6	3	PC	EE	IIOT2206	Algorithms and Data Structures	T	3	0	0	3	3	30	20	50	3 Hours
7	3	PC	EE	IIOT2207	**Lab.:** Algorithms and Data Structures	P	0	0	2	2	1		60	40	
8	3	HS	EE	IIOT2208	Engineering Economics and Management	T	3	0	0	3	3	30	20	50	3 Hours
9	3	PC	EE	IIOT2209	Sensors & Actuators for IIOT	T	3	0	0	3	3	30	20	50	3 Hours
						TOTAL THIRD SEM	**18**	**0**	**6**	**24**	**21**				

List of Audit Course

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
1	3	HS		AU2123	YCCE Communication Aptitude Preparation (YCAP3)	**A**	3	0	0	3	0				

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
Fourth Semester															
1	4	PC	EE	IIOT2251	Control System Engineering	T	3	0	0	3	3	30	20	50	3 Hours
2	4	PC	EE	IIOT2252	**Lab.:** Control System Engineering	P	0	0	2	2	1		60	40	
3	4	PC	EE	IIOT2253	Mechatronics	T	3	0	0	3	3	30	20	50	3 Hours
4	4	PC	EE	IIOT2254	**Lab.:** Mechatronics	P	0	0	2	2	1		60	40	
5	4	PC	EE	IIOT2255	Microprocessor and Interfacing	T	3	0	0	3	3	30	20	50	3 Hours
6	4	PC	EE	IIOT2256	**Lab.:** Microprocessor and Interfacing	P	0	0	2	2	1		60	40	
7	4	PC	EE	IIOT2257	Analog and Digital Communication	T	3	0	0	3	3	30	20	50	3 Hours
8	4	PC	EE	IIOT2258	**Lab.:** Analog and Digital Communication	P	0	0	2	2	1		60	40	
9	4	STR	EE	IIOT2259	Design Tool Lab-1	P	0	0	2	2	2		60	40	
10	4	STR	EE	IIOT2260	**Lab.:** Electronics Workshop	P	0	0	2	2	2		60	40	
						TOTAL FOURTH SEM	**12**	**0**	**12**	**24**	**20**				

List of Audit Course

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
1	4	HS		GE2121	Environmental Studies	**T**	2	0	0	2	0				
3	4	HS		AU2124	YCCE Communication Aptitude Preparation (YCAP4.1) for CV,ME,CT,IT,CSE, IIoT, AIML, CSD, AIDS	**A**	3	0	0	3	0				

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TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

TA = for Practical : MSPA will be 15 marks each**

		June 2022	1.01	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

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B.TECH SCHEME OF EXAMINATION 2021-22

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electronics Engineering)

Industrial IOT

SoE No.
IoT-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours L	T	P	Hrs	Credits	% Weightage MSEs*	TA**	ESE	ESE Duration Hours
Fifth Semester															
1	5	PC	EE	IIOT2301	IoT Communication Network	**T**	3	0	0	3	3	30	20	50	3 Hours
2	5	PC	EE	IIOT2302	Microcontroller & its Applications	**T**	3	0	0	3	3	30	20	50	3 Hours
3	5	PC	EE	IIOT2303	**Lab. :** Microcontroller & its Applications	**P**	0	0	2	2	1		60	40	
4	5	PC	EE	IIOT2304	Data Analytics	**T**	3	0	0	3	3	30	20	50	3 Hours
5	5	PC	EE	IIOT2305	**Lab.:** Data Analytics	**P**	0	0	2	2	1		60	40	
6	5	PC	EE	IIOT2306	Object Oriented Programming	**T**	3	0	0	3	3	30	20	50	3 Hours
7	5	PC	EE	IIOT2307	**Lab.:** Object Oriented Programming	**P**	0	0	2	2	1		60	40	
8	5	PC	EE	IIOT2308	CNC and Robotics	**T**	3	0	0	3	3	30	20	50	3 Hours
9			EE		**Professional Elective-I ***	**T**	3	0	0	3	3	30	20	50	3 Hours
10	5	STR	EE	IIOT2310	Industrial Visit	**P**	0	0	0	0	1		60	40	
					TOTAL FIFTH SEM		**18**	**0**	**6**	**24**	**22**				

List of Professional Electives-I *

Professional Electives -I

1	5	PE-I		IIOT2311	System C Progrming
2	5	PE-I		IIOT2312	Industry 4.0 and Smart Systems
3	5	PE-I		IIOT2313	Advanced Microprocessor

Audit Courses

1	5	HS		AU2126	YCCE Communication Aptitude Preparation (YCAP5.1) for CV,ME,CT,IT,CSE, IIoT, AIDS, CSD, AIML	**A**	3	0	0	3	0	

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TA = for Practical : MSPA will be 15 marks each**

		June 2022	**1.01**	**Applicable for AY 2022-23 Onwards**
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(Department of Electronics Engineering)

Industrial IOT

SoE No.
IoT-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
Sixth Semester															
1	6	PC	EE	IIOT2351	Digital System Design	T	3	0	0	3	3	30	20	50	3 Hours
2	6	PC	EE	IIOT2352	**Lab.:** Digital System Design	P	0	0	2	2	1		60	40	
3	6	PC	EE	IIOT2353	Embedded System Design	T	3	0	0	3	3	30	20	50	3 Hours
4	6	PC	EE	IIOT2354	**Lab.:** Embedded System Design	P	0	0	2	2	1		60	40	
5	6	PC	EE	IIOT2355	Data Acquisition & Signal Conditioning	T	3	0	0	3	3	30	20	50	3 Hours
6	6	PC	EE	IIOT2356	Machine Learning for IIoT	T	3	0	0	3	3	30	20	50	3 Hours
7	6	PC	EE	IIOT2357	**Lab.:** Machine Learning for IIoT	P	0	0	2	2	1		60	40	
8	6	PC	EE	IIOT2358	Design Tool **Lab-2**	P	0	0	2	2	2		60	40	
9	6	PC	EE	IIOT2359	Cryptograpghy for IIoT	T	3	0	0	3	3	30	20	50	3 Hours
10	6	PE	EE		**Professional Elective-II**	T	3	0	0	3	3	30	20	50	3 Hours
11	6	PE	EE		**Lab: Professional Elective-II**	P	0	0	2	2	1		60	40	
					TOTAL SIXTH SEM		**18**	**0**	**10**	**28**	**24**				

List of Professional Electives- II

Professional Electives-II

1	6	PE-II	EE	IIOT2361	PE-II Digital Image processing
	6	PE-II	EE	IIOT2362	PE-II: **Lab.:** Digital Image processing
2	6	PE-II	EE	IIOT2363	PE-II Flexible Manufacturing System
	6	PE-II	EE	IIOT2364	PE-II: **Lab: :** Flexible Manufacturing System
3	6	PE-II	EE	IIOT2365	PE-II Digital Signal Processing
	6	PE-II	EE	IIOT2366	PE-II **: Lab:** Digital Signal Processing

Audit Courses												
1	6	HS		AU2130	YCCE Communication Aptitude Preparation (YCAP6.3) for CT, IT, CSE, IIoT, AIDS, CSD, AIML	A	3	0	0	3	0	

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(Scheme of Examination w.e.f. 2022-23 onward)

SoE No.
IoT-203.1

(Department of Electronics Engineering)

Industrial IOT

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
					Seventh Semester										
1	7	PC	EE	IIOT2401	Cloud Computing	T	3	0	0	3	3	30	20	50	3 Hours
2	7	PC	EE	IIOT2402	**Lab.:** Cloud Computing	P	0	0	2	2	1		60	40	
3	7	PC	EE	IIOT2403	Internet of Things Applications	T	3	0	0	3	3	30	20	50	3 Hours
4	7	PC	EE	IIOT2404	**Lab.:** Internet of Things Applications	P	0	0	2	2	1		60	40	
5	7	PE	EE		**Professional Elective-III**	T	3	0	0	3	3	30	20	50	3 Hours
6	7	PE	EE		**Professional Elective-IV**	T	3	0	0	3	3	30	20	50	3 Hours
7	7	PE	EE		**Lab:Professional Elective-IV**	P	0	0	2	2	1		60	40	
8	7	PE	EE		**Professional Elective-V**	T	3	0	0	3	3	30	20	50	3 Hours
9	7	STR	EE	IIOT2409	Industrial IoT based Mini Project-3	P	0	0	4	4	2		100		
10	7	STR	EE	IIOT2410	CRT	P	0	0	0	0	2		100		
					TOTAL SEVENTH SEM		**0**	**10**	**25**	**22**	**22**				

List of Professional Electives-III,IV & V

Professional Electives -III

1	7	PE-III	EE	IIOT2411	Power Electronics and Drives
2	7	PE-III	EE	IIOT2412	Wireless Sensor Network
3	7	PE-III	EE	IIOT2413	Additive Manufacturing

Professional Electives -IV

1	7	PE-IV	EE	IIOT2421	PE IV:Industrial Automation
	7	PE-IV	EE	IIOT2422	PE IV: **Lab. :** Industrial Automation
2	7	PE-IV	EE	IIOT2423	PE IV: Design for Manufacturing and Assembly
	7	PE-IV	EE	IIOT2424	PE IV: **Lab.:** Design for Manufacturing and Assembly
3	7	PE-IV	EE	IIOT2425	PE IV: Wireless Communication for IIoT (5 G)
	7	PE-IV	EE	IIOT2426	PE IV: **Lab.:** Wireless Communication for IIoT

Professional Electives -V

1	7	PE-V	EE	IIOT2431	PE V: Cyber Security
2	7	PE-V	EE	IIOT2432	PE V: Operating Systems for IIoT
3	7	PE-V	EE	IIOT2433	PE V: SQL & Non SQL

					Eighth Semester										
1	**8**	**STR**		**IIOT2451**	**Major Project/ Industrial Internship Evaluation**	P	0	0	12	12	9		60	40	
2	**8**	**STR**		**IIOT2452**	**Extra Curricular Activity Evaluation**	P	0	0	0	0	1		100		
					TOTAL EIGHTH SEM		**0**	**12**	**12**	**10**	**10**				
					GRAND TOTAL	**15**	**39**	**22**	**55**	**89**	**158**				

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Bachelor of Technology

SoE & Syllabus 2021

1st Semester

(Department of Electronics Engineering

Industrial Internet of Things (IIoT)

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(Department of Electronics Engineering)

Industrial IOT

SoE No.
IoT-203

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
First Semester															
1	1	BES	EL	IIOT2101	Basic Electrical Machines	T	3	0	0	3	3	30	30	40	3 Hours
2	1	BES	EL	IIOT2102	**Lab.:** Basic Electrical Machines	P	0	0	2	2	1		60	40	
3	1	HS	GE	IIOT2103	Constitution of India	T	3	0	0	3	3	30	30	40	3 Hours
4	1	BS	GE	IIOT2104	Calculus	T	3	0	0	3	3	30	30	40	3 Hours
5	1	BS	GE	IIOT2105	Semiconductor Physics	T	3	0	0	3	3	30	30	40	3 Hours
6	1	BS	GE	IIOT2106	**Lab.:** Semiconductor Physics	P	0	0	2	2	1		60	40	
7	1	PC	EE	IIOT2107	C Programming	T	3	0	0	3	3	30	30	40	3 Hours
8	1	PC	EE	IIOT2108	**Lab.:** C Programming	P	0	0	2	2	1		60	40	
9	1	BES	ME	IIOT2109	Engineering Materials	T	3	0	0	3	3	30	30	40	3 Hours
						TOTAL FIRST SEM	**18**	**0**	**6**	**24**	**21**				
List of Audit Course															
1	1	HS	GE	GE2131	Universal Human Value	**T**	2	0	0	0	0				
2	1	HS	GE	GE2123	YCCE Communication & Aptitude Preparation (YCAP)	**A**	3	0	0	3	0				
3	2	HS	GE	GE2124	YCCE Communication & Aptitude Preparation (YCAP)	**A**	3	0	0	3	0				
Second Semester															
1	2	BS	GE	IIOT2151	Probabilty theory and Statistical Inference	T	3	0	0	3	3	30	30	40	3 Hours
2	2	BS	GE	IIOT2152	Applied Chemistry	T	3	0	0	3	3	30	30	40	3 Hours
3	2	BS	GE	IIOT2153	**Lab.:** Applied Chemistry	P	0	0	2	2	1		60	40	
4	2	BES	ME	IIOT2154	Engineering Graphics	T	3	0	0	3	3	30	30	40	3 Hours
5	2	BES	ME	IIOT2155	**Lab.:** Engineering Graphics	P	0	0	2	2	1		60	40	
6	2	HS	GE	IIOT2156	Technical Communication	T	3	0	0	3	3	30	30	40	3 Hours
7	2	PC	ME	IIOT2157	Fundamentals of Manufacturing Process	T	3	0	0	3	3	30	30	40	3 Hours
8	2	PC	ME	IIOT2158	**Lab.:** Fundamentals of Manufacturing Process	P	0	0	2	2	1		60	40	
9	2	PC	EE	IIOT2159	**Lab.:** Python Programming	P	0	0	2	2	1		60	40	
						TOTAL SECOND SEM	**15**	**0**	**8**	**23**	**19**				

MSEs* = Two MSEs of 15 Marks each will be conducted and total marks of MSE 1 and MSE 2 MSEs will be considered for Continuous Assessment out of 30.

TA- for Theory : 30 marks on quizzes, activities, attendance etc as included in TA plan of course teacher. TA - for Practical: MSPA will be 15 marks each as included in TA plan of course teacher

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I Semester
IIOT2101: Basic Electrical Machines

Course Objective:
The course objective is to impart knowledge of

- To impart fundamental knowledge of electricalcircuits and machinery.
- To provide problem solving experience and learningof concepts through it in electrical engineering.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Reproduce fundamentals of dc circuits & ac circuits.
CO 2	Explain, construction, working and applications of various electrical machines.
CO 3	Analyze performance of various electrical machines.

CO-PO Articulation Matrix :

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	1	1							1		
CO2	3	3	3	2	2							1		
CO3	3	3	3	3	3							1		2

Unit	Content	Hours
1	**D.C. Circuits:** Basics of electrical circuits. Equivalent resistance, Kirchhoff's Laws. Current and Voltage division rule. Mesh and Nodal analysis of dc circuits. Superposition Theorem. **A.C. Fundamentals:** Generation of alternating voltage. Values of alternating quantity. Average and rms value by mid - ordinate method and method of integration. Form factor and peak factor. Concept of phasor and its mathematical representation. Concept of phasor diagram. Phasor algebra. Power in a.c. circuit. Concept of power factor, reactive power and apparent power with power triangle.	06
2	**Single Phase Transformer:** Working principle. EMF equation. Voltage ratio and turns ratio. Step up and step down transformers. Construction of single phase transformer. Ideal transformer. Transformer on no load with phasor diagram and equivalent circuit. Practical transformer and its equivalent circuit. Referred values. Voltage Regulation. Losses in transformer. Open circuit and Short circuit tests on transformer. Efficiency and condition for maximum efficiency. Types of transformer and their applications.	07
3	**D.C. Motor :** Principle, Torque Equation, Characteristics and applications of various types of D.C. Motors, Starting of D.C. Motors, Speed control of Series and Shunt motors, Power flow in DC machines, Losses and Efficiency in D.C. machines.	07

Unit	Content	Hours
4	**Three Phase Induction Motor :** Construction. Production of rotating magnetic field. Principle of operation. Speed and slip. Frequency of rotor voltage and current. Relationship between rotor copper loss and rotor input. Developed Torque. Torque of an induction motor. Condition for maximum torque. Torque — slip and torque speed characteristics. Applications of three phase induction motor.	07
5	**Stepping Motors:** Principle of operation, Constructional features, Types of stepper Motors, Various modes of operation of Variable reluctance (VR) stepper motors, torque production in Variable Reluctance (VR) stepping motor, Multi stack VR stepper motor, Construction and working of Permanent Magnet (PM) stepper motor, Construction and working of Hybrid stepper motor, Torque angle characteristics of the stepper motor.	06
6	**Permanent Magnet Brushless DC Motors:** Fundamentals of Permanent Magnets, Principle of operation, Magnetic circuit analysis, EMF and Torque equations, Characteristics and control. **Servomotors:** AC Servomotors & DC Servomotors.	07

Text Books:

SN	Title	Edition	Authors	Publisher
1	Basic Electrical Engineering	1st Edition, 2005	T. K. Nagsarkar and M. S. Sukhija	Oxford Higher Education
2	Basic Electrical Engineering	2nd Edition,2006	V. N. Mittle and A. K. Mittal	The McGraw Hill Companies, New Delhi
3	Electrical Technology	2005	B.L.Theraja	S.Chand
4	Permanent Magnet and Brushless DC motors		T. Kenjo and S. Nugatory	England, Clarendon Oxford Press, 1989.

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Basic Electrical Engineering	2nd Edition,2002	I J Nagrath and D. P.Kothari	McGraw Hill, New Delhi
2	Electrical Engineering Fundamentals	2nd Edition,2001	Vincent Del Toro	Prentice Hall India, New Delhi

I Semester
IIOT2102: Lab.: Basic Electrical Machines

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data, communicate and present effectively through laboratory journals.

Lab Experiment List:

Expt. No	Name of Experiment
1	To verify Kirchhoff's voltage law and Kirchhoff's current law.
2	To study R —L— C series circuit.
3	To verify Superposition theorem.
4	To study R —L— C parallel circuit.
5	To study balanced three phase star (Y} connected load.
6	To perform O.C. and S.C. tests on a single phase transformer.
7	To study balanced three phase delta (D) connected load
8	To find transformation ratio, regulation and efficiency of a single phase transformer.
9	To study speed control of dc motor.
10	To study speed control of three phase induction motor.

I Semester
IIOT2103: Constitution of India

Course Objective: To enable the student understand the importance of constitution, the structure of executive, legislature, judiciary and analyze federalism in the Indian context and evaluate the Indian Political scenario of the emerging challenges.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Explain the basic concepts of Constitution of India.
CO 2	Describe the various Fundamental rights
CO 3	Analyze the Impact of federalism on the State
CO 4	Explain Industrial Law and Judiciary

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1								2				2		
CO 2												2		
CO 3						4						4		
CO 4														
CO 5									2					

Syllabus:

Unit	Content	Hours
1	**Origin and Meaning** Origin of history of Constitution, Meaning of the constitution law and constitutionalism, Kingship and Republic States in Ancient India	7
2	**Concept of the Constitution of India** Preamble, The union and its territory, Citizenship	6
3	**Federalism** Salient features of Federalism, Structures and features of Indian Federalism, Panchayat Raj System	7
4	**Fundamental Rights** Scheme of the Fundamental rights, duties, Scheme of the Fundamental Right to Equality, The scheme of the Fundamental Duties and its legal status	6

Unit	Content	Hours
5	**Legislative Power** Federal structure and distribution of legislative, Financial power between the Union and the States, Parliamentary Form of Government in India – The constitution power and status of the President of India	7
6	**Challenges to Indian Political Systems** The Executive, Directive principles of State Policy, The Union Judiciary	6

Text Books:

SN	Title	Edition	Authors	Publisher
1	—Soail Science"	1st	Dr G.N. Nimbarte	Sankalp Publication, Vidhya Nagar, Nagpur

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Constitution of India	1st	Dr. B. R. Ambedkar	Government of India, Ministry of Law and Justice
2	An Introduction to the Constitution of India	1st	Basu, D.D (2005)	New Delhi, Prentice Hall
3	Working of a Democratic Constitution of India	1st	G. Austin (2004)	New Delhi: Oxford University Press.

Website / Data sheet:

SN	Title
1	https://legislative.gov.in/
2	https://swayam.gov.in/
3	https://legislative.gov.in/constitution-of-india

I Semester
IIOT2104: Calculus

Course Objective: This subject will give basic knowledge of differential Calculus and its application, concept of integration to double and triple integrals and teach various methods for solving higher order differential equations and its applications

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Apply the knowledge of differentiation, limit and continuity to develop the Mathematical concepts to solve engineering problems
CO 2	Determine the expansion and derivatives of functions of Multiple variables and use it to find extreme values of functions
CO 3	Evaluate the improper integrals, multiple integrals and apply it to compute the area and volume of various structures.
CO 4	Solve higher order differential equations and its applications.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	3	3												
CO	3	3												
CO	3	3	3											
CO	3	3	3											

Syllabus:

Unit	Content	Hours
1	**Differential Calculus** Successive differentiation; Leibnitz theorem, Taylor‘s and Maclaurin‘s series for one variable.	7
2	**Limits and Continuity** Functions of several variables, Limit of function of two variables, theorem of limit, simultaneous limits by changing to polar coordinates. Continuity of function of two variables.	6
3	**Partial Differentiation** First and higher order partial derivatives, Euler‘s theorem, Chain Rule, Jacobians, Taylor‘s and Maclaurin‘s series for one variable. Maxima and minima and saddle point of functions of two variables.	7

Unit	Content	Hours
4	**Curve Tracing and Improper Integrals** Tracing of curves, Beta, Gamma functions and its applications.	6
5	**Multiple integrals and their Applications** Elementary double integrals, Change of variables (simple transformations) and Jacobian of transformations, Change of order of integration (Cartesian and polar), Applications to find area, volume, Elementary triple integrals.	7
6	**Differential Equations** Higher order differential equations with constant coefficients. Cauchy's and Legendre's homogeneous differential equations, Applications of differential equations.	6

Text Books:

SN	Title	Edition	Authors	Publisher
1	Advance Engineering Mathematics	6^{th} Edition	Erwin Kreyzig	John Wiley and Sons,INC
2	Engineering Mathematics	11^{th} revised edition	H.K. Dass	S.Chand, Delhi
3	Advanced Engineering Mathematics	8^{th} revised edition	H.K. Dass	S.Chand, Delhi
4	Higher Engineering Mathematics	42^{th} edition	Dr. B.S. Grewal	Khanna Publishers
5	Applied Mathematics	4^{th} Edition	P.N.Wartikar and J.N.Wartikar	Vidyarthi Griha Prakashan

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Calculus and Analytical Geometry	9th edition	G B Thomas and R L Finney	Addison-Wesley, 1999
2	Calculus		Michael Spivak and Tom Apostol	
3	A text book of Engineering Mathematics		N.P. Bali and Manish Goyal	Laxmi Prakashan,

Website / Data sheet:

SN	Title
1	https://nptel.ac.in/courses/111/106/111106146/
2	https://nitkkr.ac.in/docs/5-Multiple%20Integrals%20and%20their%20Applications.pdf
3	https://nptel.ac.in/courses/111/106/111106100/

I Semester
IIOT2105: Semiconductor Physics

Course Objective :

1.	To learn the fundamental principles of Semiconductor physics specifically concern to quantum physics, quantum computing, basics of semiconductor, sensor, Optical transition, electron motion in electric & magnetic field, electron optic devices and their engineering applications.
2.	To provide problem solving experience and learning of concepts through it in semiconductor physics, inboth, the classroom and the laboratory learning environment.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Co-relate fundamentals of quantum mechanics to solve problems dealing with quantum particle.
CO 2	Justify the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands.
CO 3	Identify the requirements of sensor material for technological application
CO 4	Illustrate optical interactions associated with semiconductor materials for their use in the devices.
CO 5	Analyze the electron motion in electric and magnetic field contributing to electronic display devices.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	3	3	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus:

Unit	Content	Hours
1	**QUANTUM PHYSICS** Wave-particle duality, Electron Diffraction, Wave packet, Heisenberg uncertainty principle, thought experiment, Significance, Applications.	6
2	**PHYSICS OF QUANTUM COMPUTING** Introduction of complex numbers, operators, eigen values, eigen functions. Wave function and its probability interpretation, Schrodinger Equation, Particle in infinite and finite potential well, quantum tunneling, Introduction to Bits and Qubits.	7
3	**BASICS OF SEMICONDUCTORS** Formation of energy bands in solids, valence and conduction band, Classification, pure and doped semiconductors, law of mass action, Conduction mechanism, Direct & indirect band gap semiconductors, Hall effect.	7
4	**SENSORS** Introduction, classification of sensors, performance characteristics, selection criteria, Requirement of sensor material, Role of sensors in industry, Examples: thermal, optical, pressure and acoustic sensors,.	6
5	**OPTICAL INTERACTIONS IN SEMICONDUCTORS** Introduction to optical transitions, metastable state and pumping, optical amplification, Density of states for photon, semiconductor laser, photovoltaic cell, LED.	7
6	**ELEMENTS OF ELECTRONIC DISPLAY** Electron motion in uniform electric and magnetic field, electron refraction, electron lens and Cathode Ray Oscilloscope.	7

Text Books:

SN	Title	Edition	Authors	Publisher
1	A Textbook of Engg. Physics	Revised 14^{th} Edition	M.N.Avadhanulu , P.G.Kshirsagar	S.Chand and Company
2	Electronic Engineering Materials and Devices	TMH edition, 10^{th} reprint	John Allision	Tata McGraw Hill
3	Introduction to Semiconductor Materials and Devices,	5^{th} Edition, 2008	M S Thyagi	Wiley Publication

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Semiconductor Devices Physics and Technology	2nd	S.M Sze	John Wiley & Son, Inc
2	Fundamentals of Physics	10th	David Halliday, Robert Resnick and Jerle Walker, John-Wiley India	John Wiley & Sons Inc
3	Text Book of Optics	Revised	Brijlal and Subramanyam	S. Chand and Company

SN	Title	Edition	Authors	Publisher
4	Laser	2nd	M. N. Avadhanulu	S. Chand and Company
5	Concept of Modern Physics :,	6th	A.Beiser	Tata McGraw-Hill
6	LASERS: Theory and Applications:.	2nd	Thyagarajan K and Ghatak A.K	Macmillan Publication
7	Solid state Physics	9th	S.O.Pillai	New Edge International Publishers
8	Solid State Physics	8th	Palanisamy	SciTech Publishers
9	Solid State Physics	8th	C. Kittel	Willey Publication
10	Instrumentation Devices and Systems	2nd	C.S. Rangan	Tata McGraw-Hill 1998
11	Modern Electronic Instrumentation and Measurement Techniques	2nd	Albert D.Helfrick and William D.Cooper	Prentice Hall of India, 2007

Website / Data sheet:

SN	Title
1	https://www.youtube.com/watch?v=qcE2Wcpm05k
2	https://www.youtube.com/watch?v=OlatlIaqPj8
3	https://www.electronics-tutorials.ws/io/io_1.html

I Semester
IIOT2106: Lab.: Semiconductor Physics

Expt.No.	Course Outcomes	Statement of Course outcomes Students are able to
1,3,4,5,8,10,11	CO 2	Justify the characteristics of semiconductor materials in terms of crystal structures, chargecarriers and energy bands.
12	CO 3	Identify the requirements of sensor material for technological application.
7,9	CO 4	Illustrate optical interactions associated with semiconductor materials for their use in the devices.
2,6	CO 5	Analyze the electron motion in electric and magnetic field contributing to electronic display devices.

List of Experiments :

Expt. No	Name of Experiment	CO	PO
1	Determination of Hall coefficient and density of charge carriers using Hall effect.	CO2	PO1,PO2
2	Determination of amplitude and frequency of sinusoidal signal using C.R.O.	CO 5	PO1,PO2
3	The study of V-I characteristics of a semiconductor diode (germanium and silicon) in forward and reverse bias mode.	CO 2	PO1,PO2
4	Determination of Band gap in a semiconductor by four probe method.	CO 2	PO1,PO2
5	Study of V-I characteristics of LED.	CO 2	PO1,PO2
6	To measure the phase shift introduced by a phase shift network using Dual beam CRO.	CO 5	PO1,PO2
7	Determination of wavelength of laser using diffraction grating.	CO 4	PO1,PO2
8	Determination of Band gap in a semiconductor using reverse biased p-n diode .	CO 2	PO1,PO2
9	Determination of divergence of laser beam.	CO 4	PO1,PO2
10	Study of V-I characteristics of Zener diode.	CO 2	PO1,PO2
11	Dependence of Hall coefficient on temperature.	CO 2	PO1,PO2
12	Determination of the velocity of Ultrasonic waves in a non –electrolytic liquid by ultrasonic interferometer	CO 3	PO1,PO2
Demonstration Experiment			
13	Determination of attenuation of a given optical fibre.		

I Semester
IIOT2107: C Programming

Course Objective:
1. To introduce students to the basic knowledge of programming fundamentals of C language.
2. To impart writing skill of C programming to the students and solving problems.
3. To impart the concepts like looping, array, functions, pointers, structure.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Understand Programing Logic
CO 2	Write algorithm & Draw a flow chart for a given problem
CO 3	Design & Develop programs using different control Flow Statement.
CO 4	Design & Develop programs using basics of Arrays, functions, pointers, structures etc.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	2	-	-	3	-	-	-	-	-	-		
CO 2	-	2	2	-	-	-	-	-	3	-	-	-		1
CO 3	3	3	2	-	-	2	-	-	3	-	-	-		1
CO 4	3	3	3			2			3					1

Unit	Content	Hours
1	**Introduction to Computer** Introduction to computer system, Algorithms, Flowcharts, Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage.	6
2	**Basics in C** History of C Language, Basic structure of C program, Concept of variables, constants anddata types in C, Console IO Operations, Operators and expressions: arithmetic, relational, Logical, Increment and decrement operator, Conditional, bitwise operators, Expressions.	6
3	**Control Flow Statements** Conditional executing using if Statement, If-else Statement,switch Statement , Unconditional Branching using goto statement, while loop and do-while loop, For loop , continue and break.	7
4	**Functions** Functions, Passing Values between Functions , Function Declaration and Prototypes ,Call by Value and Call by Reference .	6

Unit	Content	Hours
5	**Arrays & String** Arrays Declaration and Initializatio, Sample Programs using Arrays, One dimensional array 2-D arrays, Strings Handling	6
6	**Structure & Pointers** Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments Pointers, Pointers as Function Parameter .	6

Text Books:

SN	Title	Edition	Authors	Publisher
1	A Structured Programming Approach Using C	Third Edition	B.A.Forouzan and R.F. Gilberg	Cengage Learning
2	The C Programming Language	2nd edition	Brian Kernighan and Dennis Ritchie	Prentice Hall

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Let Us C	19 Edition	Yashavant kanetkar	BPB
2	Absolute beginner's guide to C	2 Edition	Greg M. Perry	Publisher: Sams Pub., 1994
3	Computer Programming and Data Structures	3 Edition	E Balagurusamy	Tata McGraw Hill

Website / Data sheet:

SN	Title
1	https://youtu.be/VSEnzzjAm0c

I Semester
IIOT2108: Lab.: C Programming

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Understand Programing Logic
CO 2	Write algorithm & Draw a flow chart for a given problem
CO 3	Design & Develop programs using different control Flow Statement
CO 4	Design & Develop programs using basics of Arrays, functions, pointers, structures etc

Lab Experiment List:

Expt. No	Name of Experiment
1	Write a C Program to print ―Welcome to Internet of Thing"
2	Write a C program to add two numbers (2 and 6) and display its sum
3	Write a C program to multiply two numbers (4 and 5) and display its product.
4	Write a C Program to calculate and display the volume of a CUBE
5	Write a C program to take input of name, roll. no and marks obtained by a student in 4 subjects of 100 marks each and display the name, roll.no with percentage score secured.
6	Write a C program to swap values of two variables .
7	Write a C program to print whether a given number is even or odd.
8	Write a C program to find the largest and smallest among three entered numbers.
9	Write a C program to find whether a character is consonant or vowel
10	Write a C program to print positive integers from 1 to 10.
11	Write a C program to display the following pattern. * * * * * * * * * * * * * * *
12	Write a C program to insert 5 elements into an array and print the elements of the array.
13	Write a C program to calculate factorial of a number
14	Write a C program to find biggest among three numbers
15	Write a C program to store information of 5 students in structure and display it.

I Semester
IIOT2109: Engineering Materials

Course Objective:
Understand the concepts of atomic bonding, crystal structures, imperfections, diffusion, mechanical properties, electron energy, and dislocations as related to processing and performance of engineering materials.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Classify engineering materials based on its structure.
CO 2	distinguish between elastic and plastic behavior of materials
CO 3	Outline various mechanical properties of engineering materials and test them to know properties.
CO 4	Discuss and compare different heat treatment processes of steel.

CO – PO Mapping:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3			1	2			1	1	2	1	1	1
CO-2	3	3	2		3	2		1	1	1	2	1	3	2
CO-3	3	3	2		3	2		1	1	1	2	1	3	2
CO-4	3	2	2		3	2			1	1	2	1	3	2

Unit	Content	Hours
1	**UNIT I** Introduction of materials, classification of materials. Properties and applications of materials. Crystalline nature of metals, specially microscopic and macroscopic examinations of materials [7 hrs]	7
2	**UNIT II** Alloys and solid solutions, types and their formations, modified Gibbs's phase rule, Lever rule for phase mixtures and their application in system. Study of equilibrium diagrams and invariant reactions. Iron-Iron carbide equilibrium diagram, critical temperatures. Effect of alloying elements. [7 hrs]	7
3	**UNIT III** Elastic and plastic deformation: slip systems, critical resolved shear stress, frank-read source, work hardening, dynamic recovery, strengthening mechanisms, recovery, recrystallization and grain growth, cold and hot working; Mechanical properties: hardness, tensile strength, ductility, resilience and toughness, impact strength, fatigue and creep. [7 hrs]	7
4	**UNIT IV** Heat treatment and its importance. Annealing, Normalizing, Hardening, TTT diagram and its construction and related Heat Treatment Processes such as Austempering, Martempering, Patenting etc. Case / Surface hardening treatments such as Carburizing, Nitriding, Cyaniding, Carbonitriding, Flame and Induction hardening. **[7 hrs]**	7

Unit	Content	Hours
5	**UNIT V** Introduction to types of composites: metal matrix, ceramic matrix, polymer matrix and carbon-carbon composites; Characteristics of polymer matrices, Method of preparation of fibres (glass and carbon). **[7 hrs]**	7
6	**UNIT VI** Non-Ferrous Alloys – Study of non-ferrous alloys such as brasses (Cu-Zn diagram), Bronzes (Cu-Sn diagram), Aluminum Alloys (e.g. Al-Si & Al-Cu diagram), Bearing materials. Powder Metallurgy: Powder manufacture and Conditioning, Production of Sintered Structural Components, Self-lubricating bearing, Cemented Carbides, Ceramics, Sintered Carbide cutting tools. **[7 hrs]**	7

Text Books:

SN	Title	Edition	Authors	Publisher
1	Material science and engineering	Delhi, 2005	V. Raghavan	PHI
2	Fundamentals of Materials Science and Engineering, An Integrated Approach	3rd Edition, 2008.	William D. Callister & David G. Rethwisch,	John Wiley
3	Introduction to Engineering Metallurgy	21st revised edition, 2007	Dr. B K Agrawal	Tata McgraHill
4	Introduction to Physical Metallurgy	29st revised edition, 2009	Sidney H.Avner	McGraw-Hill,1964
5	Engineering Physical Metallurgy and Heat Treatment	21st revised edition, 1988	Yu Lakhtin	Mir publishers, Moscow, Russia
6	Metallurgy for Engineers	4th Revised edition 1987	E C Rollason	E. Arnold,

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Materials Science and Engineering	Singapore, 2002.	W.D. Callister ,	John Wiley & Sons,
2	Principles of Materials Science and Engineering: An Introduction	2008.	W.F. Smith	Tata Mc-Graw Hill
3	Principles of Electronic Engineering Materials	2007.	S. O. Kasap	Tata Mc-Graw Hill,

Website / Data sheet:

S N	Title
1	IISC Banglore : https://nptel.ac.in/courses/112/108/112108150/
2	IIT Madras : https://nptel.ac.in/courses/112/106/112106293/
3	IIT Delhi :https://nptel.ac.in/courses/113/102/113102080/

I Semester
IIOT GE2131: Universal Human Value

Course Objective: To help the students appreciate 'VALUES' and 'SKILLS' by facilitating development of a Holistic perspective towards life, profession , happiness and prosperity as well understand ethical human conduct.

Course Outcome: After completion of the course, student will demonstrate the ability to :-

CO 1	Experiential validation through the way to verify right or wrong.
CO 2	Practice living in harmony with natural acceptance
CO 3	Realise the importance of relationships.
CO 4	Recognize the importance of sustainable co-existence in existence

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1								2				2		
CO 2							3					3		
CO 3									1	1		1		
CO 4							1			1		1		

Syllabus:

Unit	Content	Hours
1	**Course Introduction** Need, Basic Guidelines, Content and Process for Value Education, Understanding the need, basic guidelines, content and process for Value Education, Self Exploration–what is it? - its content and process; ‗Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration ,Continuous Happiness and Prosperity- A look at basic Human Aspirations	6
2	**Understanding Harmony in the Human Being** - Harmony in Myself!,Understanding human being as a co-existence of the sentient ‗I' and the material ‗Body', Understanding the needs of Self (‗I') and ‗Body' ,Understanding the Body as an instrument of ‗I' (I being the doer, seer and enjoyer),Understanding the characteristics and activities of ‗I' and harmony in ‗I'	6
3	**Understanding Harmony in the Family** Harmony in Human-Human Relationship, Understanding Harmony in the family – the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure Ubhay-tript; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas;	5

Unit	Content	Hours
4	**Understanding the harmony in the society** Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and, differentiation; the other salient values in relationship ,Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sahasttva as comprehensive Human Goals,Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family! ,Practice Exercises and Case Studies will be taken up in Practice Sessions	6
5	**Understanding Harmony in the Nature and Existence** - Whole existence as Co-existence, Understanding the harmony in the Nature Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature , Understanding Existence as Co-existence (Sah-asttva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence , Practice Exercises and Case Studies will be taken up in Practice Session	6

Text Books:

SN	Title	Edition	Authors	Publisher
1.	The text book R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics,		R.R Gaur, R Sangal, G P Bagaria,	Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

Reference Books:

SN	Title	Edition	Authors	Publisher
1	The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010.		R.R Gaur, R Sangal, G P Bagaria	Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

Website / Data sheet:

SN	Title
1	https://swayam.gov.in/nc_details/NPTEL
2	https://www.aicte-india.org/press-realeases/universal-human-values-unique-course-aicte

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2021

2nd Semester

(Department of Electronics Engineering

Industrial Internet of Things (IIoT)

28 June 2019

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. IoT-203

B.TECH SCHEME OF EXAMINATION 2021-22

(Scheme of Examination w.e.f. 2021-22 onward)

(Department of Electronics Engineering)

Industrial IOT

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
First Semester															
1	1	BES	EL	IIOT2101	Basic Electrical Machines	T	3	0	0	3	3	30	30	40	3 Hours
2	1	BES	EL	IIOT2102	**Lab.:** Basic Electrical Machines	P	0	0	2	2	1		60	40	
3	1	HS	GE	IIOT2103	Constitution of India	T	3	0	0	3	3	30	30	40	3 Hours
4	1	BS	GE	IIOT2104	Calculus	T	3	0	0	3	3	30	30	40	3 Hours
5	1	BS	GE	IIOT2105	Semiconductor Physics	T	3	0	0	3	3	30	30	40	3 Hours
6	1	BS	GE	IIOT2106	**Lab.:** Semiconductor Physics	P	0	0	2	2	1		60	40	
7	1	PC	EE	IIOT2107	C Programming	T	3	0	0	3	3	30	30	40	3 Hours
8	1	PC	EE	IIOT2108	**Lab.:** C Programming	P	0	0	2	2	1		60	40	
9	1	BES	ME	IIOT2109	Engineering Materials	T	3	0	0	3	3	30	30	40	3 Hours
						TOTAL FIRST SEM	**18**	**0**	**6**	**24**	**21**				
List of Audit Course															
1	1	HS	GE	GE2131	Universal Human Value	**T**	2	0	0	0	0				
2	1	HS	GE	GE2123	YCCE Communication & Aptitude Preparation (YCAP)	**A**	3	0	0	3	0				
3	2	HS	GE	GE2124	YCCE Communication & Aptitude Preparation (YCAP)	**A**	3	0	0	3	0				
Second Semester															
1	2	BS	GE	IIOT2151	Probabilty theory and Statistical Inference	T	3	0	0	3	3	30	30	40	3 Hours
2	2	BS	GE	IIOT2152	Applied Chemistry	T	3	0	0	3	3	30	30	40	3 Hours
3	2	BS	GE	IIOT2153	**Lab.:** Applied Chemistry	P	0	0	2	2	1		60	40	
4	2	BES	ME	IIOT2154	Engineering Graphics	T	3	0	0	3	3	30	30	40	3 Hours
5	2	BES	ME	IIOT2155	**Lab.:** Engineering Graphics	P	0	0	2	2	1		60	40	
6	2	HS	GE	IIOT2156	Technical Communication	T	3	0	0	3	3	30	30	40	3 Hours
7	2	PC	ME	IIOT2157	Fundamentals of Manufacturing Process	T	3	0	0	3	3	30	30	40	3 Hours
8	2	PC	ME	IIOT2158	**Lab.:** Fundamentals of Manufacturing Process	P	0	0	2	2	1		60	40	
9	2	PC	EE	IIOT2159	**Lab.:** Python Programming	P	0	0	2	2	1		60	40	
						TOTAL SECOND SEM	**15**	**0**	**8**	**23**	**19**				

MSEs* = Two MSEs of 15 Marks each will be conducted and total marks of MSE 1 and MSE 2 MSEs will be considered for Continuous Assessment out of 30.

TA- for Theory : 30 marks on quizzes, activities, attendance etc as included in TA plan of course teacher. TA - for Practical: MSPA will be 15 marks each as included in TA plan of course teacher

TA – for Practical : MSPA will be 15 marks each

		June 2021	**1.00**	**Applicable for AY 2021-22 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

II Semester
IIoT2151: Probability Theory and Statistical Inference

Course Objective: This course provides an indication of the relevance and important of the probability theory and mathematical statistics in solving practical problems in the field of multidisciplinary engineering applications.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Identify an appropriate probability distribution for a given discrete or continuous random variable and compute probabilities.
CO 2	Make use of probability distributions to solve a given problem.
CO 3	Apply concepts of sampling theory to find probabilities and estimates parameters of various problems.
CO 4	Test the hypothesis and estimate confidence intervals at different levels.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3												
CO 2	3	3												
CO 3	3	3	3											
CO 4	4	4	4											

Syllabus:

Unit	Content	Hours
1	**Random Variables & Probability Distributions** Conditional probability, Baye's theorem. Random variables: Discrete and Continuous random variables, Probability function and Distribution function, Joint distributions. Independent Random variables, Conditional Distribution.	7
2	**Mathematical Expectation** Mathematical Expectation, Variance & Standard Deviation, Moments, Moment generating function, Skewness and Kurtosis.	7
3	**Special Probability Distributions** Binomial, Geometric, Poisson, Exponential, Normal, Central Limit theorem.	6
4	**Sampling Theory** Population and sample. Statistical inference. Sampling with and without replacement. Random samples, population parameters, sample statistics. Sampling distribution of means (known and unknown). Sampling distribution of proportions.	6

Unit	Content	Hours
5	**Estimation** Unbiased and efficient estimates. Point estimates and interval estimates. Confidence interval for means, Confidence interval for proportions, Confidence interval for differences and sums of mean and proportions.	6
6	**Decision Theory** Definition of hypothesis, Testing of hypothesis for large samples using normal distributions. Testing of hypothesis for small distributions (student's t-test, F-test) . Goodness of fit test(Chi-square distribution).	7

Text Books:

SN	Title	Edition	Authors	Publisher
1	The theory and problems of probability and Statistics	3rd edition	M. R. Spiegel	Schaum series. (McGraw Hill)
2	Basic Statistics for Business and economics		E. K.Bowen, M. K.Star	McGraw Hill
3	Probability Theory And Mathematical Statistics For Engineers		V. S. Pugachev	
4	Probability and Statistics	2nd edition	Michael J. Evans and Jeffrey S. Rosenthal	

Reference Books:

SN	Title	Edition	Authors	Publisher
1	A First course in probability	Sixth Edition	Sheldon Ross	Pearson Education
2	Fundamentals of Mathematical statistics	3rd Edition	S. C.Gupta and V.K.Kapoor	
3	Probability and Statistics for Engineering	6th edition	Miller Freund and Johnson.	

Website / Data sheet:

SN	Title
1	https://nptel.ac.in/courses/117/105/117105085/
2	https://nptel.ac.in/courses/111/104/111104032/
3	https://nptel.ac.in/courses/111/105/111105043/

II Semester
IIoT2152: Applied Chemistry

Course Objective:

- To impart intensive and extensive knowledge of the subject enriching students to understand the roleof Chemistry in the field of engineering.
- To keep students abreast with the latest developments and applications of modern materials.
- To gain basic principles, instrumentation and applications of analytical techniques.

Course Outcome: After completion of the course, student will be able to

CO 1	Interpret different thermodynamic functions. (L2)
CO 2	Describe basic concepts of electrochemistry and apply the knowledge for energy storage devices. (L3)
CO 3	Develop better awareness about global environmental concerns. (L2)
CO 4	Classify advanced engineering materials in technological applications. (L2)
CO 5	Develop analytical and instrumental skills. (L3)

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2					1							
CO2	3	1					1							
CO3	2	2												
CO4	3						2							
CO5	3	2					2							

Unit No.	Contents	Max. Hrs.
1	**Energetics**: Introduction, Internal energy, enthalpy, Gibb's free energy, Free energy change and chemical equilibrium. Spontaneous and non-spontaneous processes. I and II law of thermodynamics. Entropy and its significance. Numericals on Internal energy and enthalpy change. Thermodynamic applications to physical and chemical equilibrium.	07
2	**Electrochemistry**: Introduction, metallic and electrolytic conductance, resistance, specific resistance, conductance, specific conductance, equivalent and molar conductance. Variation of conductance with dilution. Electrode and electrode potentials. Nernst Equation. Faraday's laws and Numericals. Industrial applications: Electroforming, Electrowinning, Electrolytic refining.	06

Unit No.	Contents	Max. Hrs.
3	**Energy storage devices** **Basic concepts**: Primary and secondary battery. Energy density, power density, energy efficiency, cycle life, shelf life. Secondary battery: Ni-metal hydride battery, Lithium-ion battery. **H_2-O_2 Fuel cell**: Principle, working, advantages, disadvantages, applications. Differences between battery and a fuel cell. **Supercapacitors**: Definition, types, characteristics and application.	06
4	**Chemical Kinetics** : Introduction, Rate of reaction and factors influencing rate of reaction, order & molecularity of reaction. Kinetic equations of different orders: Zero Order, First Order, Second Order and numericals.	06
5	**Industrial pollution, its impacts on environment and control.** Introduction: Industrial pollution and its types. Sources of pollution in electronic industries. Hazardous waste management. Battery waste management. e-waste pollution, its impact on environment , rules of regeneration of e-waste recycling and its managements as per government norms.	06
6	**Advanced Materials :** **Nanomaterials**: Definition of nanomaterials, nano scale. Carbon Nanotubes and types. **Application of Nanomaterials**: Applications of nanomaterials in medicine, environment, and electronics. Nanotechnology for waste reduction and improved energy efficiency. Threats of Nanomaterials. **Silicon Chips:** Introduction. Physical, chemical, electrical & mechanical properties and applications. **Polymers in electronic industries:** Piezo, pyroelectric, Ferroelectric polymers.	07

Text Books:

SN	Title	Edition	Authors	Publisher
1	A Textbook of Engineering Chemistry	Eleventh Edition.	S S. Dara	S.Chand & Co New Delhi
2	Engineering Chemistry	Sixteenth Edition	Jain & Jain;	Dhanpat Rai & sons New Delhi.
3	Physical Chemistry	Eighth edition-2006).	P. W. Atkins,	Oxford Publications
4	Engineering Chemistry		B.Sivasankar	Tata McGraw-Hill

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Chemistry in Engineering		Lloyd A.Munro	Prentice-hall
2	Applied chemistry for engineers		T.S.Gyngell	
3	Engineering Chemistry		B.K.Sharma Krishna Prakashan media private LTD	
4	Chemistry of Advanced Materials		CNR Rao	RSC Publications
5	Handbook of Semiconductor Silicon Technology	1st Edition.	William C. O'Mara, Robert B. Herring	NOYES PUBLICATIONS I "P I Park Ridge, New Jersey. USA.

Website / Data sheet:

SN	Title
1	Silicon Chips: What are Computer Chips Made Of? https://www.intel.com/content/www/us/en/history/museum-making-silicon.html
2	What is silicon, and why are computer chips made from it? https://www.extremetech.com/extreme/208501-what-is-silicon-and-why-are-computer-chips- made-from-it

II Semester
IIoT2153: Lab.: Applied Chemistry

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 2	Describe basic concepts of electrochemistry and apply the knowledge for energy storage devices. (L3)
CO4	Classify advanced engineering materials in technological applications. (L2)
CO 5	Develop analytical and instrumental skills. (L3)

Lab Experiment List:

Expt. No	Name of Experiment (Minimum 4 experiments from Group I & II each and Demonstrations on 2 experiments should be conducted)
	Group I:
1	To determine the strength of a given potassium dichromate solution with N/20 sodium thiosulphate solution.
2	Estimation of Nickel by complexometry.
3	Determination of copper by iodometric titration.
4	Estimation of Fe^{2+} ions by redox titration.
5	Estimation of Fe^{3+} ions by spectrophotometric method.
6	Synthesis of urea formaldehyde resin.
	Group II:
7	Preparation of Printed Circuit Board.
8	Determination of molecular weight of a polymer using Ostwald's viscometer.
9	Determination of ion exchange capacity of a cation exchange resin.
10	Proximate analysis of Coal.
11	Determination of thinner contain in oil paint.
12	Electroplating Copper on Stainless steel.
	Demonstration:
13	Determination of Faradays first law.
14	Determination of Faradays second law.
15	Determination of conductivity of water sample by conductivity meter

II Semester
IIoT2154: Engineering Graphics

Course Objectives:

- To make the students aware of how an industry communicates technical information graphically.
- To understand the principles of presenting necessary information with accuracy and clarity
- To develop skill to draw clearly and rapidly and to read the drawings drawn by others ,effectively using manual and software techniques
- To develop the imagination skills that are essential while creation of successful design.

Course Outcomes: After completion of the course, student will demonstrate the ability to

Course Outcome	*Statement*	*B Level*
CO 1	**Construct** orthographic drawing and isometric drawing of a given object	L3
CO 2	**Evaluate** Projections of various One Dimensional, Two dimensional, Three-dimensional objects	L4
CO 3	**Develop** the lateral surfaces of various solids, their section and intersection**.**	L3
CO 4	**Practice** the use of software tools used for Two dimensional drawings.	L3

CO – PO Mapping:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	BL
CO1	3	2	-	-	3	-	-	-	2	3	-	3	3	-	L3
CO2	3	2	-	-	3	-	-	-	2	3	-	3	3	-	L4
CO3	3	2	-	-	3	-	-	-	2	3	-	3	3	-	L3
CO4	3	2	-	-	3	-	-	-	2	3	-	3	3	-	L3
Average	3	2	-	-	3		-	-	2	3		3	3	-	-

Unit No.	Contents	Max. Hrs.
I	**Theory of Orthographic Projections:** Introduction, Quadrant system, Theory of orthographic projection, Projection method and principal planes, First and Third angle projections. **[CO1 , CO4]**	**3**
II	**Theory of Isometric Projections:** Theory of isometric projection, Method for drawing isometric views, Different problems on isometric projections. **[CO1 , CO4]**	**2**

Unit No.	Contents	Max. Hrs.
III	**Lines:** Projection of points, Projection of lines, True lengths and inclinations, apparent lengths and inclinations, various positions of lines in different quadrants, Traces of lines, projection of line on auxiliary plane. **[CO2 , CO4]**	2
IV	**Planes and Solids:** Projection planes: (Polygonal Lamina, Circular Lamina), Projection of Perpendicular planes and oblique planes. Auxiliary views (Auxiliary planes) Projection of Solids :(Inclined to One Plane Only) - Polyhedra (Regular and Irregular Polyhedra), Solids of Revolution **[CO2 , CO4]**	4
V	**Section of Solids and Development of Surfaces:** Types of Section planes, Sectional top view, True shape. Development of different solids using Radial line and parallel line methods. **[CO3 , CO4]**	2
VI	**Intersection of Surfaces of solids:** Intersection between similar solids, Intersection between dissimilar solids, Lines and Curves of Intersection. **[CO3 , CO4]**	2

Text Books:

SN	Title	Edition	Authors	Publisher
1	Engineering Graphics with AutoCAD	Revised Edition(2014)	D.M. Kulkarni, A. P. Rastogi and A. K. Sarkar	PHI learning Pvt. Ltd.
2	Engineering Drawing	53 rd Edition 2017	N. D. Bhatt	Charotar Publishing House Pvt. Ltd

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Engineering Drawing	2008	D. A. Jolhe	Tata McGraw Hill Publications
2	Engineering Drawing	2010	K. L. Narayana & P. Kannaiah	SciTech Publication
3	Engineering Drawing	Multicolor revised edition	R. K. Dhawan	S. Chand Publication

Software: Auto CAD
Website / Data sheet:

SN	Title
1	**Engineering Graphics IIT Roorkee** https://youtu.be/ANEvQyt3PnU
2	**Engg Drawing and Computer Graphics** https://nptel.ac.in/courses/112/105/112105294/
3	**Engineering Drawing** https://nptel.ac.in/courses/112/103/112103019/

II Semester
IIoT2155: Lab.: Engineering Graphics

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

Course Outcome	*Statement*	*Level*
CO 1	**Construct** orthographic drawing and isometric drawing of a given object	L3
CO 2	**Evaluate** Projections of various One Dimensional, Two dimensional, Three dimensional objects	L4
CO 3	**Develop** the lateral surfaces of various solids, their section and intersection.	L3
CO 4	**Practice** the use of software tools used for Two dimensional drawings.	L3

Lab Experiment List:

Expt. No	Name of Experiment
1	Introduction of AutoCAD Basic Commands
2	Orthographic Projection
3	Isometric Projection
4	Projection of Straight Line
5	Projection of Planar Surface
6	Projection of Solid
7	Section and Development of Solid
8	Intersection of Surfaces
9	Drawing Sheet 1: Convention for various lines, Dimensioning and Orthographic Projection
10	Drawing Sheet 2: Projection of line, planar surface or solid. (Any one)

II Semester
IIoT2156: Technical Communication

Course Objective: Explain the fundamentals of communication and classify different speech sounds of English, using different components of oral communication and draft technical documents precisely .

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Apply different modes for effective communication
CO 2	Competently use the phonology of English language
CO 3	Apply nuances of LSRW skills
CO 4	Communicate through different channels

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1										3				
CO 2										3				
CO 3									3	3				
CO 4										2		2		

Syllabus: Technical Communication

Unit	Content	Hours
1	**Basics of Communication : -** Language as a tool of communication & characteristics of language Process of Communication, Levels of Communication, Flow of Communication, Networks of Communication, Classification of Barriers (Intrapersonal, Interpersonal, Organizational).	7
2	English Phonetics :- Speech Mechanism, Organs of speech, Consonant and Vowels sounds,Worde stress rules	6
3	Interview Skills :- Purpose , expectations of employer and preparation for Interview, Types, Types of Questions & Answering Techniques, Telephonic Interviews – preparation and guidelines, Reading Techniques (Exercise based on Complex Unseen passages	7
4	Oral Skills :- Group Communication- (Purpose, Different types of Group Communication, Organizational GD, GD as a part of selection process), Meeting (purposes, preparation, procedure and minutes of meeting), Listening Skills -definition types and traits	6

Unit	Content	Hours
5	Presentation & Visual Communication :- Presentation and audience analysis, Organizing content, Nuances of presentation, Visual Communication – Introduction & importance, Role & Psychology of color in visual communication.	6
6	Technical Written Communication:- Memo, Email, Report -Types, Characteristics, prewriting aspects of report and preparing writing aspects of report), Types of paragraphs.	7

Text Books:

SN	Title	Edition	Authors	Publisher
1.	Technical Communication		Raman &Sharma	Oxford University Press
2	Textbook of English Phonetics for Indian Students		T.Balasubramaniam	Macmillan India Ltd

Reference Books:

SN	Title	Edition	Authors	Publisher
1	How to Develop Self – Confidence & Influence People by Public Speaking		Dale Carnegie	
2	Communication Skills		Asha Kaul	
3	Body Language		Allen Peas	
4	Gerson's Gerson Communication		Technical	

Website / Data sheet:

SN	Title
1	https://swayam.gov.in/nc_details/NPTEL
2	https://en.wikipedia.org/wiki/Technical_communication
3	https://www.skillsyouneed.com/ips/communication-skills.html

II Semester
IIoT2157: Fundamentals of Manufacturing Process

Course Objective:

- To emphasize the importance manufacturing sciences in the day-to-day life, and to study the basic manufacturing processes and tools used.
- To understand the conventional manufacturing processes like casting, metal forming, and welding process.
- Identify and explain basic components and function of different machine tools.
- Understand the application and limitations of various machining processes with regard to shape formation and surface quality.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Differentiate various Manufacturing processes
CO 2	Elaborate and classify different casting and joining processes.
CO 3	Summarize cutting tool materials and tool geometries for different metals.
CO 4	Analyze appropriate machining processes for different machining conditions.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO-1	3	1	2	2	1	2	2	3	1	2	3	2	2	2
CO-2	3	1	2	2	1	2	2	3	1	2	3	2	2	2
CO-3	3	1	2	2	1	2	2	3	1	2	3	2	2	2
CO-4	3	1	2	2	1	2	2	3	1	2	3	2	2	2

Unit	Content	Hours
1	**Introduction:** Understanding Manufacturing, Fundamental Approaches of Manufacturing, Manufacturing Process Specific Advantages and Limitations, Materials and Manufacturing Processes, Classification of Manufacturing Processes, Selection of Manufacturing Processes, Applications of Manufacturing Processes, Effect of Manufacturing Processes on Mechanical Properties	8
2	**Casting:** Introduction and Suitability, Steps of Casting Processes, Casting: Terminology, The Pattern Allowances, Types of moulding and castings, Metal Working Processes, Sheet Metal Operations, Dies and Die sets	7

Unit	Content	Hours
3	**Joining Processes:** Joining of metals, welding and types of welding, brazing, soldering and welding defects, weldability and welding defects	8
4	**Introduction to marching and Cutting tools:** Introduction to marching, types of cutting tools, Tool materials, Tool geometry, Chip Formation, Types of Chips,, tool failure and tool life, Cutting fluids.	7
5	**Conventional Manufacturing Machines-I:** Construction of simple lathe, mechanism and attachments for various operations, machine specifications, basis for selection of cutting speed, feed and depth of cut, Capstan and Turret Lathe and special purpose Machines. Shaper type, specification, types of drives in shapers Planer: specifications, type of planner. Mechanism for planner: Driving mechanism, feeding mechanism	7
6	**Conventional Manufacturing Machines-II:** Milling specifications, types milling machine, Mechanisms and Types of milling cutters. Grinding operations, grinding wheel, specifications & selection, Grinding operations. Drilling machines, tools for drilling, classification of drills, twist drills, type of drilling machines. Drilling machines operations. Reaming operation, description of reamers, type of reaming operations. Boring: types of boring machine, micro boring, boring operations. Broaching: Introduction, type of broaches, and type of broaching machines.	8

Text Books:

SN	Title	Edition	Authors	Publisher
1.	Manufacturing Technology (Metal Cutting & Machine Tools)	2nd Edition (2019)	P N Rao	The McGraw-Hill Companies
2	Manufacturing Science	2nd Edition (2020)	Ghosh & Malik	East West publication
3	Workshop Technology (Volume-II)	2nd Edition (2019	Hajra Choudhary	MPP LTD.

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Manufacturing Engineering & Technology	1st Edition (2019)	S Kalpakjian & SR Schmid	Pearson Education Canada
2	Technology of machine Tools	1st Edition (1984)	Krar & Oswald	McGraw- Hill
3	Processes & Materials of Manufacture	1st Edition (1990)	R Lindberg	Allyn and Bacon Technology & Engineering

Reference Books:

SN	Title	Edition	Authors	Publisher
4	Production Technology	1st Edition (2018)	Karunakaran	HMT
5	Workshop Technology (Volume I & II)	2nd Edition (2019)	Bawa	McGraw-Hill Companies

Website / Data sheet:

SN	Title
1	**Manufacturing Process Meaning and Types** https://www.engineeringarticles.org/manufacturing-process-meaning-and-types/
2	**Metal Forming** https://nptel.ac.in/courses/112/107/112107144/

II Semester
IIoT2158: Lab.: Fundamentals of Manufacturing Process

Course Objective:

- To emphasize the importance manufacturing sciences in the day-to-day life, and to study the basic manufacturing processes and tools used.
- To understand the conventional manufacturing processes like casting, metal forming, and welding process.
- Identify and explain basic components and function of different machine tools.
- Understand the application and limitations of various machining processes with regard to shape formation and surface quality.

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Differentiate various Manufacturing processes
CO 2	Elaborate and classify different casting and joining processes.
CO 3	Summarize cutting tool materials and tool geometries for different metals.
CO 4	Analyze appropriate machining processes for different machining conditions .

Lab Experiment List:

Expt. No	Name of Experiment	CO
1	Study of Various molding processes.	1,2
2	Study of various types of melting furnaces and cupola in detail.	2
3	Study of different types of wooden pattern	2
4	Preparation of mould making.	2
5	Preparation of casting job along with Study of casting processes.	2
6	Demonstration of working of Lathe Machine and study of its mechanism.	3,4
7	Demonstration of working of Shaper Machine and study of its mechanism	3,4
8	Demonstration of working of Milling machine and study of its mechanism.	3,4
9	Demonstration of working of Drilling machine and study of its mechanism.	3,4
10	Job making involving various operations such as MIG ,TIG welding processes etc.	2
11	Preparation of job on punching press	2
12	Report of foundry visit	2

II Semester
IIoT2159: Lab.: Python Programming

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

Course Outcome	Statement On successful completion of this course, students should be able:	**Bloom's Taxonomy Level**
CO 1	To **understand** syntax and semantics of language	L1, L2
CO 2	To **understand** and **apply** the basics of the programming language	L2,L3
CO 3	To **analyse** and **apply** special language features	L3,L4
CO 4	To **evaluate** and **create** functions for any application	L5,L6

Lab Experiment List:

Expt. No.	**Name of Experiments**
1	Installation of IDE and write first program in Python using "variables".
2.	To understand "Data Types" of Python.
3.	To perform different operations on "Strings" in Python.
4.	To understand different "Operators" in Python.
5.	To learn and write program using "List" and "Tuple" in Python.
6.	To learn and write program using "Set" and "Dictionary" in Python.
7.	To learn and write program using Loop statements in Python.
8.	To learn "1D NumPy" of Python.
9.	To learn "2D NumPy" of Python.(Optional)
10.	To learn and write program using functions in Python.(Optional)

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2021

3rd Semester

(Department of Electronics Engineering

Industrial Internet of Things (IIoT)

June 2022

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.TECH SCHEME OF EXAMINATION 2021-22

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electronics Engineering)

Industrial IOT

SoE No. IoT-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
					Third Semester										
1	3	PC	EE	IIOT2201	Digital Electronics	T	3	0	0	3	3	30	20	50	3 Hours
2	3	PC	EE	IIOT2202	**Lab. :** Digital Electronics	P	0	0	2	2	1		60	40	
3	3	BS	GE	IIOT2203	Linear Algebra and Graph Theory	T	3	0	0	3	3	30	20	50	3 Hours
4	3	PC	EE	IIOT2204	Electronics Deivces and Circuits	T	3	0	0	3	3	30	20	50	3 Hours
5	3	PC	EE	IIOT2205	**Lab.:** Electronics Deivces and Circuits	P	0	0	2	2	1		60	40	
6	3	PC	EE	IIOT2206	Algorithms and Data Structures	T	3	0	0	3	3	30	20	50	3 Hours
7	3	PC	EE	IIOT2207	**Lab.:** Algorithms and Data Structures	P	0	0	2	2	1		60	40	
8	3	HS	EE	IIOT2208	Engineering Economics and Management	T	3	0	0	3	3	30	20	50	3 Hours
9	3	PC	EE	IIOT2209	Sensors & Actuators for IIOT	T	3	0	0	3	3	30	20	50	3 Hours
					TOTAL THIRD SEM		**18**	**0**	**6**	**24**	**21**				

List of Audit Course

1	3	HS	FY	GE2131	Universal Human Values	**T**	2	0	0

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
					Fourth Semester										
1	4	PC	EE	IIOT2251	Control System Engineering	T	3	0	0	3	3	30	20	50	3 Hours
2	4	PC	EE	IIOT2252	**Lab.:** Control System Engineering	P	0	0	2	2	1		60	40	
3	4	PC	EE	IIOT2253	Mechatronics	T	3	0	0	3	3	30	20	50	3 Hours
4	4	PC	EE	IIOT2254	**Lab.:** Mechatronics	P	0	0	2	2	1		60	40	
5	4	PC	EE	IIOT2255	Microprocessor and Interfacing	T	3	0	0	3	3	30	20	50	3 Hours
6	4	PC	EE	IIOT2256	**Lab.:** Microprocessor and Interfacing	P	0	0	2	2	1		60	40	
7	4	PC	EE	IIOT2257	Analog and Digital Communication	T	3	0	0	3	3	30	20	50	3 Hours
8	4	PC	EE	IIOT2258	**Lab.:** Analog and Digital Communication	P	0	0	2	2	1		60	40	
9	4	STR	EE	IIOT2259	Design Tool Lab-1	P	0	0	2	2	2		60	40	
10	4	STR	EE	IIOT2260	**Lab.:** Electronics Workshop	P	0	0	2	2	2		60	40	
					TOTAL FOURTH SEM		**12**	**0**	**12**	**24**	**20**				

List of Audit Course

1	4	HS		GE2121	Environmental Studies	**T**	2	0	0

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

TA = for Practical : MSPA will be 15 marks each**

		June 2022	**1.01**	**Applicable for AY 2022-23 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

III Semester
IIOT2201: Digital Electronics

Course Objective:

- The purpose of this course is to develop a strong foundation of digital electronics.
- Understand concepts of combinational and sequential circuits.
- Analyze the synchronous and asynchronous logic circuits.

Course Outcome: After completion of the course, Students will have the ability to

CO 1	Understand, Define and simplify the concept of Digital Electronics Circuits.
CO 2	Apply the concept of different combinational logic circuits which may be used in various digital systems
CO 3	Analyze sequential logic and their applications
CO 4	Design and Analyze the function of different types of counters andMoore and Mealy machines.
CO 5	Conduct experiments to demonstrate the specific application of digital electronics using suitable digital ICs

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2												1	
CO 2	2	2											1	
CO 3	2	2	2										1	
CO 4	2	2	3										1	
CO 5	2	2	2	3										

Syllabus:

Unit	Content	Hours
1	ntroduction to Number Systems and its conversions: Binary Arithmetic, 1's and 2's Complement Arithmetic, Signed Binary Number Arithmetic, Codes- BCD code and Gray Code , BCD arithmetic, Logic Gates.	7

2	Methods to simplify logical Functions: Boolean Laws & Algebras, Sum of Product & Product of Sum, Karnaugh Map (up to 6 Variable)	7
3	Combinational Logic Design: Half & Full Adder, Half & Full Subtractor, Multiplexer, Demultiplexer, Encoder, Decoder, word problems based on combinational circuits	7
4	Sequential Logic Design: Latches and flip-flops(RS, D, JK, JK Master-Slave & T), Excitation & Truth Table, Flip-flop conversions, Shift registers	8
5	Introduction to Synchronous and Asynchronous sequential Circuits: Modulus Counter, Ring counter, Johnson counter, Ripple counter, Design of Synchronous Counter.	7
6	Finite state machine : Moore and Mealy circuits ,sequence detector using Moore and Mealy machines, Method of partition.	6

Text Books:

SN	Title	Edition	Authors	Publisher
1	Modern Digital Electronics	3rd Edition	RP Jain	Tata McGraw Hill
2	Digital Circuits & Microprocessors.	1988	Hebert Taub	Mc Graw Hill

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Fundamentals of Logic Design.	3rd edition 2007.	C.H.Roth	Public Work & Services
2	Engg Approach to Digital Design.	1993	Fletcher	Prentice Hall of India
3	Digital Design.	4th edition 2008	M. Morris Mano	Prentice Hall of India,

Website / Data sheet:

SN	
1	https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials
2	
3	

III Semester
IIOT2202: Lab. : Digital Electronics

Lab Experiment List:

Expt. No	of Experiment
1	To Verify the Truth table for the basic logic gates and universal gates.
2	To Verify the truth table of Basic gates using Universal gates
3	To Implement & Verify Boolean Expression using Basic Logic Gates
4	To Implement & verify Half adder and full adder circuit.
5	To Implement & verify Half subtractor and full subtractor circuit
6	To verify truth table of Multiplexer and Demultiplexer .
7	To Implement BCD to Seven segment Display combinational circuit
8	To Implement & Verify 4bit binary adder circuit.
9	To verify the truth table of S-R & D flip-flop
10	To verify the truth table of J-K & T flip-flop.
11	To Design 2 bit binary synchronous/asynchronous counter
12	To Design Finite State Machine using decoder IC

III Semester
IIOT2203: Linear Algebra and Graph theory

Course Objective: This course provides the mathematical knowledge required to analyze problems encountered in engineering. Students are acquainted with the solution of system of linear equation, eigen values and eigen vectors and they can apply this course in many areas of engineering such as computer graphics, cryptography, wire-less communication, signal processing, robotics and animation.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Solve systems of linear equations using rank of matrix in engineering field.
CO 2	Determine eigenvalues and eigenvectors and solve eigenvalue problems.
CO 3	Explain the concepts of vector space and subspace, span and basis and inner product
CO 4	Find the suitable computing methods and graph theory concepts to solve complex problems.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	3	3												
CO	3	3												
CO	3	3												
CO	3	3	3											

Syllabus:

Unit	Content	Hours
1	**Elementary matrix operations** Elementary Matrix and their operations, transpose of Matrix, ranks of matrix (Echelon Form) Inverse of matrix by Adjoin Matrix method Consistency of System of Equations. Matrix Decomposition.	6
2	Diagonalization of matrix Eigen Values and Eigen vectors, Linear dependence and independence of Eigen Vectors, Cayley-Hamilton Theorem and Sylvester's Theorem.	6
3	Group Theory Groups, Subgroups and Homomorphism, Cosets and Lagrange's theorem, Normal subgroups, Semi groups and Monoids. Homomorphism of semigroups and monoids, Sub semi groups and sub monoids.	7
4	Ring and Field Definitions and Examples of rings, sub ring, Integral domain, Polynomial ring, Ring homomorphism, Finite field.	7
5	Vector Space Vector Space, Subspace, Sum of Sub space, linear combination, Linear Span and basis, Spanning sets, Ranges and Kernel (null space) of linear transformation	6
6	Graph Theory Basic concepts of graph theory, Paths and circuits, Reach ability and connectedness, Matrix Representation of graphs, Tree and their representation and operations, Rooted trees, Path lengths in rooted trees, Multi graphs and weighted graphs, and graph isomorphism, shortest paths in weighted graphs, Hyper graphs, transitive closure, Spanning trees, Kruskal's algorithm, Prim's algorithm.	7

Text Books:

SN	Title	Edition	Authors	Publisher
1	Advance Engineering Mathematics	9th Edition	Kreyszig.	Wiley
2	Higher Engineering Mathematics	40th edition	B.S. Grewal	Publisher: S.Chand & Company Limited
3	Linear Algebra		Hoffman and Kunze	prentice Hall of India, New Delhi
4	Linear Algebra and its Applications		Glbert Strang	Nelson Engineering (2007)

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Applied Mathematics for Engineers	3rd edition	L.A. Pipes and Harville	McGraw Hill.
4	Matrix and Linear Algebra,		K.B.Datta	Prentice Hall of India.
5	A text book of Engineering Mathematics		N.P. Bali & Manish Goyal	Laxmi Prakashan

Website / Data sheet:

SN	Title
1	https://archive.nptel.ac.in/courses/111/104/111104137/
2	https://onlinecourses.nptel.ac.in/noc21_ma03/preview
3	https://onlinecourses.nptel.ac.in/noc22_ma10/preview

III Semester
IIOT2204: Electronics Devices and Circuits

Course Objective:

- The purpose of this course is to present a clear consistent picture of the internal physical behavior of many electronic devices so that their studies of electronic circuit and system will be meaningful.
- The purpose of this course is to introduce to the students the basics of biasing transistor **circuits, feedback** amplifiers, rectifiers, & analyzing different two terminal devices.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Analyze different types of semiconductor devices, their operation and characteristics.
CO 2	Design and analyze the DC bias circuitry of BJT and FET.
CO 3	Analyze and model BJT, FET and MOSFET for small signal.
CO 4	Apply concept of feedback to improve stability of circuits.
CO 5	Design circuits using the transistors and oscillators.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2	--	--	--	--	--	--	--	--	--	--	--
CO	1	2	3	--	--	--	--	--	--	--	--	1	--	--
CO	1	3	2	--	--	--	--	1	1	--	--	--	--	--
CO	1	2	3	--	--	--	--	1	1	--	--	--	--	--
CO	1	2	3	--	--	--	--	1	1	--	--	1	--	--

Syllabus:

Unit	Content	Hours
1	**Transistors:** - BJT - structure, operation, characteristics and Biasing BJT structure, Symbol, Basic operation. Input and Output Characteristics in CE, CB and CC configuration, Comparison of transistor configurations. BJT biasing, Stability factor.	06
2	**Transistors:** JFET, MOSFET- structure, operation, characteristics and Biasing JFET: - Structure, Symbol, Basic operation, Drain and Transfer Characteristics. Biasing arrangements for JFET, Universal JFET bias curve, MOSFET: - Structure, Symbol, Basic operation, Drain and Transfer Characteristics. MOSFET Biasing. N-MOS, P-MOS, Comparison of BJT and FET.	08

3	**Single Stage Amplifiers**: BJT small signal model – Analysis of CE, CB, CC amplifiers, Miller's theorem.	08
4	**FET & MOSFET:** small signal model– Analysis of CS, CG and CD amplifiers.	05
5	**Power Amplifiers:** Classes of power amplifiers – Class A, Class B, Class AB, Class C and Class D amplifiers, Analysis of Class A, Class B, Distortions in amplifiers, concept of Total Harmonic Distortion (THD), Comparison of power amplifiers	05
6	**Feedback Amplifiers and Oscillators**: Feedback Amplifiers: - Feedback Concept, Classification of amplifiers based on feedback topology, (Voltage, Current, Trans-conductance and Trans-resistance amplifiers), Effect of negative feedback on various performance parameters of an amplifier, Analysis of one circuit for each feedback topology. Oscillators: - Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillator.	08

Text Books:

SN	Title	Edition	Authors	Publisher
1	Electronic Device and Circuits	Second Edition	Millman & Halkies	Tata McGraw Hill.
2	Electronic devices and Circuits Theory	Eighth edition	Boylestead & Nashelsky	PHI

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Integrated Electronics	Fourth Edition	Millman Halkies	Tata McGraw Hill
2	Electronic Device and Circuits	Fourth Edition	David A. Bell	PHI.
3	Electronic Devices	Seventh Edition	Floyd	Pearson

Website / Data sheet:

SN	Title
1.	https://components101.com/transistors/sl100-pinout-specifications-equivalent-datasheet
2.	https://alltransistors.com/adv/pdfview.php?doc=ao4407.pdf&dire=_aosemi
3.	https://www.electronicshub.org/power-amplifier/#:~:text=A%20power%20amplifier%20is%20an,%2C%20headphones%2C%20RF%20transmitters%20etc.
4.	http://103.152.199.179/YCCE/yccelibrary.html
5.	https://nptel.ac.in/courses/108105159
6.	https://archive.nptel.ac.in/courses/108/105/108105159/

III Semester
IIOT2205: Lab. : Electronics Devices and Circuits

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	**Analyze and Design** analog electronic circuits to compute required parameters.
CO 2	**Conduct** experiments to determine various parameters using hardware and/or simulation tools
CO 3	**Implement** a mini-project and demonstrate the given problem using suitable analog electronic components

Lab Experiment List:

Expt. No	Name of Experiment
1	To plot input & output Characteristics of Common Base Transistor Configuration. Find input & output Resistance and Current Gain.
2	To plot input & output Characteristics of Common Emitter Transistor Configuration. Find input & output Resistance and Current Gain.
3	Analysis of Fixed Bias circuit of transistor.
4	Analysis of Self Bias circuit of transistor
5	To plot the Drain and Transfer characteristics of Field Effect Transistor (FET) in CS mode.
6	To plot the Drain and Transfer characteristics of Metal Oxide Semiconductor Field Effect Transistor (MOSFET) in CS mode.
7	To Plot the Frequency Response of single stage RC coupled CE amplifier with and without feedback
8	To simulate the Frequency Response of Common Source MOSFET Amplifier on LT-spice.
9	To determine the efficiency of Class B push pull power amplifier and to study cross over distortion.
10	To determine the phase shift in RC phase shift oscillator.
11	Mini Project

III Semester
IIOT2206: Algorithms and Data Structures

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Understand the trade-offs of algorithms and programming aspects
CO 2	Apply various operation on data Structure
CO 3	Analyze various types of Data Structure
CO 4	Implement various types of algorithms and analyze performance of system
CO 5	Develop programs using data structures and latest compilers

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	1	1	--	--	--	--	--	--	1	--	--	1	--	--
CO -2	2	3	--	--	2	--	--	--	1	--	--	1	--	--
CO -3	3	3	--	--	2	--	--	--	1	--	--	1	--	--
CO -4	3	3	3	--	3	--	--	--	1	--	1	1	--	--
CO -5	--	--	--	--	3	--	--	--	1	--	1	1	--	--
Average														

Syllabus:

Unit No.	Content	Max. Hrs.
1	Introduction to Algorithms, Basics of Algorithm, Sub Algorithms, Procedures and Functions, Analysis of Algorithms, Time and Space Complexity, Programming aspects with respect to structured programming, Top down and bottom-Up Approach	**7**
2	Arrays, Operations, Types, Representation of 1D, 2D arrays in memory, Sparse Matrices, Sorting, Quick Sort, Merge Sort, Insertion, Radix, Selection and Bubble Sort, Heap Sort, Searching, Linear, Binary Search, Hashing and collision Handling mechanism.	**7**
3	Stack, Fundamentals, Operations, Push , Pop , Applications of Stacks, Evaluation of Expressions, Recursion, Stack Machines and Multiple Stacks, Queues , Operations, Add , Delete, Types of Queues , Priority Queues, Circular Queue, Dequeue	**6**

4	Fundamentals of singly, Doubly, Circular, Linked Stacks and Queues, Examples of Linked List, Circular Linked List, Doubly Linked List and Dynamic Storage Management, Garbage Collection, Compaction and Applications of Linked List, Operations of Polynomials, Generalized Linked List.	**6**
5	Basic Terminology, Binary Tree Traversals, Threaded Storage Representation, Binary Search Tree, Applications of Tree, Preliminary Treatment of AVL Trees, B-Trees, B+ Trees	**7**
6	Basic Terminology, Graph Representation, Matrix, List, Multi-List, Graph Traversals, Breath First Search, Depth First Search, Minimum Cost Spanning Trees, Shortest Path Algorithm, Topological Sort, Critical Path.	**7**

Text Books

SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Data Structures and Program, Design in C	Second Edition	Kruse, Leung and Tondo	PHI
2	Data Structures, Schuam Series	Fifth Edition	Seymour Lipschutz,G.A. V. Pai	TMH

ence Books

SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Fundamentals of Data Structures	Fifth Edition	Ellis Horowtiz and Sartaj Sahani	Galgotia,Publications
2	An Introduction to Data Structures with Applications	Second Edition	Tremblay & Sorenson	TMH

Website / Data sheet:

SN	
1.	https://www.programiz.com/dsa
2.	https://opendatastructures.org/
3.	https://www.geeksforgeeks.org/data-structures/
4.	http://103.152.199.179/YCCE/yccelibrary.html
5.	https://nptel.ac.in/courses/106102064

III Semester
IIOT2207: Lab. : Algorithms and Data Structures

CO 1	Understand the trade-offs of algorithms and programming aspects
CO 2	Apply various operation on data Structure
CO 3	Analyze various types of Data Structure
CO 4	Implement various types of algorithms and analyze performance of system
CO 5	Develop programs using data structures and latest compilers

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	1	1	--	--	--	--	--	--	1	--	--	1	--	--
CO -2	2	3	--	--	2	--	--	--	1	--	--	1	--	--
CO -3	3	3	--	--	2	--	--	--	1	--	--	1	--	--
CO -4	3	3	3	--	3	--	--	--	1	--	1	1	--	--
CO -5	--	--	--	--	3	--	--	--	1	--	1	1	--	--
Average														

Experiment List

Expt No.	Name of Experiment
1	Write a program using control Structure & Statements
2	Write a program using If –else structure
3	Write a program using Case Statement
4	Write a program for Functions
5	Write a program for Macros
6	Write a program for Pointers
7	Write a program for Structures
8	Write a program for Linked List
9	Write a program for Doubly linked list
10	Write a program for graphs
11	Write a program for Trees
12	Write a program for Search Algorithms
13	Write a program for Stacks

III Semester
IIOT2208: Engineering Economics and Management

Course Objective: This subject will Provide the knowledge of various concept of economics and management and will introduce the economic alternatives, Marketing and Financial Practices in the Organisation and Engineering field.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Develop perspective about economy based on logical reasoning and estimate the economic outcomes.
CO 2	Interprets comparative advantage of resources.
CO 3	Explain the Functions of Management and identify tools and techniques of Marketing of goods and services
CO 4	Analyze the role of Financial Accountancy and Management in the Organisation

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3						3				3			
CO 2	3						3				3			
CO 3	2						2				2			
CO 4	3						3		3		3			

Syllabus:

Unit No.	Content	Max. Hrs.
1	**Introduction to Economics and engineering Economy:** Economics and engineering economy, Utility analysis- Cardinal, ordinal, Law of diminishing marginal utility, Laws of demand and supply, elasticity of demand, its measurement and application.	6
2	**Engineering Production and Costs** Factors of Production: Land, Labour, Capital, Enterprise and their peculiarities, Concepts and types of costs, Law of Variable proportions (Law of diminishing marginal returns) and Return to Scale (Increasing, constant and decreasing), Economies and diseconomies of scale. Inflation: Meaning, types, causes and consequences, measures to control inflation, Concepts of deflation and Stagflation.	7

3	**Market structures - equilibrium output and price** Forms of market structures: Perfect competition, monopolistic competition, oligopoly, duopoly and monopoly, Demand and revenue curves for firm and industry in various forms of market structure, Total, average and marginal revenue curves, equilibrium of firms and industries under various forms of market structures, Price discrimination.	7
4	**Principle of Management** Evolution of Management Thought : Scientific and Administrative Theory of Management , Definition and Concept of Management, Functions of Management : Planning, Organizing, Directing, Coordinating and Controlling, Motivational Theories, Concept of Leadership	6
5	**Marketing Management** Marketing Management - Definition & scope, Selling & Modern Concepts of Marketing, Market Research, Customer Behaviors, Product Launching, Sales Promotion, Pricing, Channels of Distribution, Advertising, Market Segmentation, Marketing Mix, Positioning, Targeting	7
6	**Financial Accountancy and Management :** Definition & Functions of Finance department, Sources of finance, Types of capital, Types of Taxes, Introduction of Accountancy and its rules, Preparation of Books of Account- Jounal, Posting of transaction into ledger and preparation of trial balance, Introduction of trading account, profit and loss account and balance sheet	6

Text Books:

SN	Title	Edition	Authors	Publisher
1	Modern Economics	13th Edition	H. L. Ahuja	S. Chand Publisher, 2009
2	Modern Economic Theory	3rd edition	K. K. Devett	S. Chand Publisher,2007
3	Principle of Economics	7th edition	Mankiw N. Gregory	Thomson, 2013
4	Principles of Management	9th edition	Harold Koontz Ramchandra	Tata McGrow hills
5	Marketing Management: Planning, Implementation and Control	3rd Edition	Ramaswamy V.S. and Namakumari S	Macmillian
6	Financial Services	19th Edition	Khan M Y	Tata McGraw Hill, 19

Reference Books:

SN	Title	Edition	Authors	Publisher
1.	Advance Economic Theory	17th Edition	H. L. Ahuja	S. Chand Publisher, 2009
2.	International Trade	12th edition	M. L. Zingan	Vindra Publication, 2007
3.	Macro Economics	11th edition	M. L. Zingan	Vindra Publication, 2007
4.	Monitory Economics:	1st Edition	M. L. Sheth	Himayalaya Publisher, 1995
5.	Economics of Development and Planning	12th edition	S. K. Misra and V. K. Puri	Himalaya Publishing House, 2006.
6.	Foundations of Financial Markets and Institutions	3rd Edition	Fabozzi	Pretice Hall
7.	Fundamentals of Financial Instruments	2nd Edition	Parameshwaran	Wiley India
8.	Marketing Management	3rd Edition	Rajan Saxena	Tata McGraw Hill

Website / Data sheet:

SN	Title
1	https://youtu.be/vOykcERGw9Y
2	https://youtu.be/4GO357Ab1s4
3	https://youtu.be/CSSH0N_xcwo

III Semester
IIOT2209: Sensors & Actuators for IIOT

Course Objective:

- To provide in depth knowledge in physical principles applied in sensing.
- To provide good knowledge of working of different types of sensors used in various application areas.
- To elaborate the theoretical and practical aspects of sensors and actuators, their classifications, recent trends and their applications in day to day life.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	*Understand and explain the concepts of Sensors and Actuators* **.**
CO 2	Explain the working of magnetic sensors and its applications in real time scenario
CO 3	acquire knowledge of Model linear actuators and differentiate various solenoids
CO 4	Evaluate performance characteristics of different types of sensors

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	2		-	-	-	1	-	-	-	-	-	-
CO 2	3	2	2	-	-	-	-	1	-	-	-	-	-	-
CO 3	3	2	2	-	-	-	-	1	-	-	-	-	-	-
CO 4	3	2	2	-	-	-	-	1	-	-	-	-	-	-

Syllabus:

Unit	Content	Hours
1	Introduction- Classification of Sensors and Actuators - Magnetic Sensors - Linear and Latching Solenoid Actuators - Stepper Motors - Special Magnetic Devices - Rotary and Linear Actuators - Magnetic Materials and Technology - Soft Magnetic Materials - Hard Magnetic Materials -Coating Technologies - Magnetic Materials Market and Applications	7
2	Magnetic Sensors - Theory of Magnetic Sensors - Magnetic Sensor Analysis - VR Sensors - Solid-State Sensors - Magnetic Sensor Applications - Magnetic Speed Sensor Requirements - Magnetic Speed Sensor Applications - Magnetic Position Sensor Applications - VR Sensor Noise	6

3	PRESSURE SENSOR -Units of pressure - Manometers – Different types – Elastic type pressure gauges – Bourdon type bellows – Diaphragms – Electrical methods – Elastic elements with LVDT and strain gauges – Capacitive type pressure gauge – Piezo resistive pressure sensor – Resonator pressure sensor – Measurement of vacuum – McLeod gauge – Thermal conductivity gauges – Ionization gauge, cold cathode and hot cathode types – Testing and calibration of pressure gauges – Dead weight tester.	7
4	POSITION,PROXIMITY,FLOW,LEVELSENSORMeasurement of position using Hall effect sensors. Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor. Flow Sensors: Ultra sonic & Laser. Level Sensors: Ultra sonic & Capacitive	6
5	Linear Actuators - Mathematical Model for Linear Actuators - Fast-Acting Actuators - Disk Solenoids - Plunger Solenoids - Ball Solenoids - Conical Solenoids - Applications of Solenoid Actuators - Long Stroke Solenoid Fuel Pump - Gasoline Injectors - Natural Gas Injectors - Diesel Fuel Injectors - Compressor Solenoid Valves - Transmission Solenoid	8
6	Rotary Actuators - Disk Rotary Actuators - Disk Rotary Actuator Analysis - Disk Rotary Actuator Design - Disk Rotary Actuator Excitation Electromagnetic Circuit - Disk Rotary Actuator Toothed Magnetic Part - Disk Rotary Actuator PM - Claw Pole Rotary Actuators - Claw Pole Rotary Actuator Analysis - Claw Pole Rotary Actuator Design -Claw Pole Rotary Actuator Excitation Electromagnetic Circuit - Claw Pole Actuator Toothed Magnetic Part - Claw Pole Actuator PM - Cylindrical Rotary Actuators - Cylindrical Rotary Actuator PM - Cylindrical Rotary Actuator Excitation Electromagnetic Circuit	8

Text Books:

SN	Title	Edition	Authors	Publisher
1	Measurement Systems – Application and Design	6 th Edition	E.O. Doebelin	Tata McGraw Hill publishing company, 2003
2	Sensors and Actuators in Mechatronics, Design and Applications		Andrzej M. Pawlak	Taylor & Francis Group 2006

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Principles of Industrial Instrumentation	2nd Edition	D. Patranabis	Tata McGraw Hill Publishing Company Ltd, 1996
2	Mechanical and Industrial Measurements		R.K. Jain	Khanna Publishers, New Delhi,1999
3	A Course on Mechanical Measurements, Instrumentation and Control		A.K. Sawhney and P. Sawhney	DhanpathRai and Co, 2004

Website / Data sheet:

SN	Title
1	https://nptel.ac.in/courses/108/105/108105064/
2	https://nptel.ac.in/courses/108/108/108108147/
3	http://103.152.199.179/YCCE/yccelibrary.html

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2021

4th Semester

(Department of Electronics Engineering

Industrial Internet of Things (IIoT)

June 2022

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.TECH SCHEME OF EXAMINATION 2021-22

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electronics Engineering)

Industrial IOT

SoE No.
IoT-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
Third Semester															
1	3	PC	EE	IIOT2201	Digital Electronics	T	3	0	0	3	3	30	20	50	3 Hours
2	3	PC	EE	IIOT2202	**Lab. :** Digital Electronics	P	0	0	2	2	1		60	40	
3	3	BS	GE	IIOT2203	Linear Algebra and Graph Theory	T	3	0	0	3	3	30	20	50	3 Hours
4	3	PC	EE	IIOT2204	Electronics Deivces and Circuits	T	3	0	0	3	3	30	20	50	3 Hours
5	3	PC	EE	IIOT2205	**Lab.:** Electronics Deivces and Circuits	P	0	0	2	2	1		60	40	
6	3	PC	EE	IIOT2206	Algorithms and Data Structures	T	3	0	0	3	3	30	20	50	3 Hours
7	3	PC	EE	IIOT2207	**Lab.:** Algorithms and Data Structures	P	0	0	2	2	1		60	40	
8	3	HS	EE	IIOT2208	Engineering Economics and Management	T	3	0	0	3	3	30	20	50	3 Hours
9	3	PC	EE	IIOT2209	Sensors & Actuators for IIOT	T	3	0	0	3	3	30	20	50	3 Hours
					TOTAL THIRD SEM		**18**	**0**	**6**	**24**	**21**				

List of Audit Course

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P
1	3	HS	FY	GE2131	Universal Human Values	**T**	2	0	0

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
Fourth Semester															
1	4	PC	EE	IIOT2251	Control System Engineering	T	3	0	0	3	3	30	20	50	3 Hours
2	4	PC	EE	IIOT2252	**Lab.:** Control System Engineering	P	0	0	2	2	1		60	40	
3	4	PC	EE	IIOT2253	Mechatronics	T	3	0	0	3	3	30	20	50	3 Hours
4	4	PC	EE	IIOT2254	**Lab.:** Mechatronics	P	0	0	2	2	1		60	40	
5	4	PC	EE	IIOT2255	Microprocessor and Interfacing	T	3	0	0	3	3	30	20	50	3 Hours
6	4	PC	EE	IIOT2256	**Lab.:** Microprocessor and Interfacing	P	0	0	2	2	1		60	40	
7	4	PC	EE	IIOT2257	Analog and Digital Communication	T	3	0	0	3	3	30	20	50	3 Hours
8	4	PC	EE	IIOT2258	**Lab.:** Analog and Digital Communication	P	0	0	2	2	1		60	40	
9	4	STR	EE	IIOT2259	Design Tool Lab-1	P	0	0	2	2	2		60	40	
10	4	STR	EE	IIOT2260	**Lab.:** Electronics Workshop	P	0	0	2	2	2		60	40	
					TOTAL FOURTH SEM		**12**	**0**	**12**	**24**	**20**				

List of Audit Course

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P
1	4	HS		GE2121	Environmental Studies	**T**	2	0	0

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

TA = for Practical : MSPA will be 15 marks each**

		June 2022	1.01	Applicable for AY 2022-23 Onwards
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

IV Semester
IIOT2251: Control System Engineering

Course Objective:
Students will learn:
1 The role of a control engineer in multi-disciplinary teams.
2 To apply the knowledge gained in basic mathematics, physical sciences and engineering courses to derive mathematical models of typical engineering processes.
3 To use transfer function and state space models for control system analysis in time and frequency domain.
4 The importance of stability in control systems and the various methods to determine it.
5 To construct root locus plot and frequency response plots such as polar plot, Bode plot, Nyquist plot etc.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Understand concepts related to linear control system
CO 2	Apply the concepts of control system to obtain the system Transfer function
CO 3	Apply the concepts of control system to obtain the system Transfer function
CO 4	Apply frequency domain analysis method to various linear control systems

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	2	-	-	-	-	-	2		-	2	-	-
CO 2	2	3	2	-		-	-	-	2		-	2	-	-
CO 3	2	3	3	-	-	-	-	-	2		-	2	-	-
CO 4	2	3	3	-	-	-	-	-	2		-	2	-	

Syllabus:

Unit	Content	Hours
1	Mathematical modeling of physical systems: Electrical systems - Electromechanical systems, Mechanical systems – Thermal systems	8
2	Open loop control and close loop control with examples. Block diagram algebra & reduction techniques Signal flow graph, its constructions and Mason's gain formula.	7
3	Time domain analysis: Time-domain specifications, various test signals and its importance, steady state error (ess) analysis	7

4	Routh-Hurwitz stability criterion. Root Locus Technique: Definitions - Root locus diagram - Rules to construct root loci - Effect of pole zero additions on the root loci.	8
5	Frequency domain analysis: Frequency response - Bode plot - Polar plot - Nyquist plot – phase margin - gain margin - Nyquist stability criterion – Relative stability analysis	8
6	Controller design: P, PI, PID - Design by Frequency-Response Approach: lag compensation, lead compensation, lead-lag compensation.	7

Text Books:

SN	Title	Edition	Authors	Publisher
1	Control system engineering I. J.	5th Edition	Nagrath& M. Gopal	New Age International
2	Modern control engineering	5th Edition	Katsuhiko Ogata	PHI Learning Private Limited
3	Automatic control systems	7thEdition	B. C. Kuo	PHI Learning Private Limited

Referance Books:

SN	Title	Edition	Authors	Publisher
1	Modern Control Systems	13th edition	Dorf, R.C., Bishop, R.H.,	Prentice Hall

Website / Data sheet:

SN	Title
1.	https://www.youtube.com/watch?v=RcuGxWc0HyQ
2.	https://www.youtube.com/watch?v=39Ggoj2fQ2c
3.	https://nptel.ac.in/courses/108105159
4.	http://103.152.199.179/YCCE/yccelibrary.html
5.	https://onlinecourses.nptel.ac.in/
6.	https://www.youtube.com/watch?v=RcuGxWc0HyQ

IV Semester
IIOT2252: Lab. : Control System Engineering

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Realize the need of control system and its recent developments. Able to model the system and simulate the model.
CO 2	Analyze the system stability based on time domain, frequency domain and root locus techniques.

Lab Experiment List:

Expt. No	Name of Experiment
1	To Study basic of open loop and closed loop control system
2	Determination of step & impulse response for a first order unity feedback system
3	Determination of step & impulse response for a second order unity feedback system
4	Determination of step & impulse response for a type '0', type '1', type '2' systems
5	Study of bode plot using matlab control system toolbox
6	Study of root locus plot using matlab control system toolbox
7	Determination of nyquist plot using matlab control system toolbox
8	Study the effect of addition of zeros to the forward path transfer function of a closed loop system

IV Semester
IIOT2253: Mechatronics

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Students will be able to model various mechatronic systems.
CO 2	Students will be able to understand the working of various motors used in mechatronic systems
CO 3	Student will be able to analyze the characteristics and use various IC's.
CO 4	Students will be able to analyze the internal hardware structure in Mechatronics Systems.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	2	2	1			1	1		2	1	1
CO 2	3	2	2	2					1	1		2	1	1
CO 3	3	2	2	3	1							2	1	1
CO 4	3	2	2	2	2				1	1		2	1	1

Syllabus:

Unit	Content	Hours
1	Introduction, sensors, actuators, modeling of systems. Recent trend of designing machine units along with electronic circuits for operation and supervision of mechanisms. Techniques of interfacing mechanical devices with computer hardware.	7
2	Basic principles ,working and specific applications of armature and field controlled D.C. Motors, Variable voltage and variable frequency control of 3 phase and single phase Induction motors, speed control of synchronous motors, Different types of stepper motors- Constriction ,working and application. Position control of stepper motors.	8
3	Common and commercial I.Cs used for amplification, timing and digital indication. Different types of actuators, working of synchro-transmitter and receiver set, Pressure to current (P/I) and l/P conversion. Electrical and hydraulic servomotors. Design of solenoid plungers and pressure and force amplification devices.	8
4	Add-on cards for sampling and actuation, 4-20 mA ports, AD-DA conversion, Peripheral interface organization, general layout of data bus and data transfer through serial and parallel modes of communication, schemes of computer networking and hierarchy in supervisory control.	7
5	Study of various integrated systems by using block diagrams. Study of systems used in Ink Jet Printers, Photo copying, Washing Machines, IC Engine fuel injection system etc	7
6	General philosophy of Artificial Neural Network simulations, Fuzzy logic for operation and control of Mechatronic systems.	7

Text Books:

SN	Title	Edition	Authors	Publisher
1	Introduction to Mechatronics and Measurement Systems	2007	Michael B.Histand and David G. Alciatore	Tata McGraw-Hill Education
2	Mechatronics	2007	Bradley, D.A., Dawson, D, Buru, N.C. and Loader, AJ.,	Chapman and Hall, 1991
3	Microprocessor Architecture, Programming and Applications	2002	Ramesh.S, Gaonkar	Prentice Hall

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Understanding Electro-Mechanical Engineering, An Introduction to Mechatronics	1996	Lawrence J.Kamm	John Wiley and Sons
2	Introduction to Microprocessors for Engineers and Scientists	2004	Ghosh, P.K. and Sridhar	PHI Learning Pvt. Ltd.

Links for E books in YCCE LIBRARY

SN	Link
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

Links for online courses including SWAYAM / NPTEL/ COURSERA/ UDEMY

SN	Link
1	https://onlinecourses.nptel.ac.in/noc21_me27/preview
2	https://nptel.ac.in/courses/112103174
3	https://www.classcentral.com/course/swayam-mechatronics-23047

IV Semester
IIOT2254: Lab. : Mechatronics

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Model various mechatronic systems.
CO 2	Understand the working of various motors used in mechatronic systems
CO 3	Analyze the characteristics and use various IC's
CO 4	Analyze the internal hardware structure in Mechatronics Systems.

Lab Experiment List:

Expt. No	Name of Experiment
1	Identifications, study and demonstration of different sensors
2	Identifications, study and demonstration of different actuators
3	Demonstration of working of various D-A and A-D converters
4	Development of ladder diagram, programming using PLC for any of the following a) Motors start and stop using 02 different sensors b) Simulation of pedestrian traffic controller c) Simulation of four road junction traffic controller d) Lift or elevator control e) Washing machine control f) Tank level control g) Soft drink vending machine control
5	Trace, interpret and demonstrate working of electro pneumatic system
6	Trace, interpret and demonstrate working of electro hydraulic system
7	Demonstration on Flip Flops and Timers.
8	Verification of P, P+I, P+D, P+I+D control actions using MATLAB
9	Demonstration on different switches and relays.
10	Analysis of control system using software like MATLAB/SIMULINK or equivalent.

IV Semester
IIOT2255: Microprocessor and Interfacing

Course Objective:

1) To understand the architecture, programming and addressing modes of Intel 8085
2) To study the instruction set and programming of 8085
3) To understand various interfacing of devices for various applications.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Describe the architecture of Microprocessor
CO 2	Write Program for an assigned task.
CO 3	Apply different address decoding techniques while interfacing Memory to Microprocessor
CO 4	Analyze and Design interfacing of Peripheral devices to Microprocessor

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO 2	3	-	-	-	2	-	-	-	1	-	-	-	-	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 4		3	2	-	-	-	-	-	-	-	-	-	-	1
CO 5														

Syllabus:

Unit	Content	Hours
1	Concept of bit, byte, nibble & word, Micro Computer organization with I/O devices and Memory.Microprocessor, address, data & control bus, Register, Memory Organisation.	6
2	Architecture of 8085 Intel microprocessor, Flag Register ,Addressing mode, pins diagram of 8085,Demultiplexing of Address & Data Bus, Generation of various control signals for I/O & Memory Organization	6
3	Basic Instruction set, Subroutine instructions like CALL, PUSH, POP, Programs based on instructions.	6

4	Delay Program,Memory Interfacing - ROM, RAM With 8085, Absolute and Linear decoding techniques.	6
5	MICROPROCESSOR APPLICATIONS – Programmable peripheral IC (8255)- Pin functions, Different Modes & Block Diagram, ADC interfacing , DAC interfacing .	6
6	USART 8251, PIT 8253, Interrupt Structure, Interrupt Controller 8259	6

Text Books:

SN	Title	Edition	Authors	Publisher
1	Microprocessor Architecture ,Programming& Application with the 8085	V'th	Ramesh Gaonkar	Pearson Publication

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Microprocessors & interfacing	2'nd	**D. V. Hall**	Tata Mc-Graw Hill ,2005

Website / Data sheet:

SN	Title
1	Nptel Video : https://www.youtube.com/watch?v=0t4LROuEVnw&list=PLwdnzlV3ogoXgNjr_oe5cWQIbf72ZY4Zf
2	https://www.youtube.com/watch?v=oRPluYsxF28&list=PLuv3GM6-gsE01L9yDO0e5UhQapkCPGnY3&index=7
3	https://www.electronicwings.com/

IV Semester
IIOT2256: Lab.: Microprocessor and Interfacing

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Describe the architecture of Microprocessor
CO 2	Write Program for an assigned task.
CO 3	Apply different address decoding techniques while interfacing Memory to Microprocessor
CO 4	Analyze and Design interfacing of Peripheral devices to Microprocessor
CO 5	Create software & Hardware solutions for complex problems

Lab Experiment List:

Expt. No	Name of Experiment
1	Determine the Opcode, Number of Bytes and Addressing mode for the following instructions (Microprocessor 8085) Also State Meaning of Instruction
2	Perform Arithmetic and Logical Operations
3	Perform Addition series of data bytes
4	Block Transfer from Source Memory Location to Destination Memory Location
5	Count number of positive data bytes from string
6	Find Largest/ Smallest data byte from string
7	Compare the data bytes from 2 strings
8	Read data from Ports of 8255 and Write data to Ports of 8255
9	Generate square waveform of 2ms using Timer IC 8253
10	Mini Project

IV Semester
IIOT2257: Analog and Digital Communication

Course Objective:

1. To Study different analog and digital modulation techniques.
2. To understand transmitter & receivers in communication systems.
3. To understand basic concept of source coding.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Analyze and compare different analog modulation schemes.
CO 2	Analyze the behavior of a communication system in presence of noise.
CO 3	Investigate pulsed modulation system and analyze their system performance
CO 4	Analyze different digital modulation schemes for communication channels.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	1										1		
CO 2	2											1		
CO 3	2	1										1		
CO 4	2	1										1		

		June 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Syllabus:

Unit	Content	Hours
1	Basic block diagram of Analog communication system, Modulation techniques: Need for modulation, Basic concepts of Amplitude Modulation: mathematical Analysis, modulation index, frequency spectrum, power requirement of AM, FM, PM, Transmitters.	7
2	Receivers: Basic receiver, Tuned Radio Frequency (TRF), Super heterodyne receiver, AM detectors, FM Detectors, Noise: Types of Noise, signal to noise ratio , Definition of Noise figure, calculation of noise figure.	8
3	Pulse Modulation: Generation and demodulation of pulse amplitude modulation (PAM); pulse width modulation (PWM); pulse position modulation (PPM) , Pulse code modulation (PCM),Time division Multiplexing, Frequency division multiplexing	7
4	Sampling theorem, Sampling and signal reconstruction, Aliasing, Types of sampling, Quantization, PCM, Companding, DPCM, ADPCM, Delta modulation, Adaptive delta modulation	8
5	Digital Modulation techniques: Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) –Phase Shift Keying (PSK) – BPSK – QPSK, Quadrature Amplitude Modulation (QAM), Minimum Shift Keying.	7
6	Source coding and channel coding: Information theory, Huffman coding, LZ coding, Basic concept of convolution code and Linear block code	8

Text Books:

SN	Title	Edition	Authors	Publisher
1	Electronic Communication System ,Fourth Edition,	4th	Gorge Kennedy	Tata McGraw-Hill
2	Digital Communications	4th	Symon Hykin	Wiley, 1988

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Digital and analog communication systems		K. Sam Shanmugam	John Wiley & Sons
2	Communication Electronics , Third Edition, 2007		Louis Frenzel	McGraw-Hill

Website / Data sheet:

SN	Title
1	http://nptel.iitm.ac.in/syllabus/syllabus.php?subjectId=117101055
2	https://nptel.ac.in/courses/117105143
3	http://103.152.199.179/YCCE/yccelibrary.html

IV Semester
IIOT2258: Lab.: Analog and Digital Communication

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	To observe and interpret the performance of AM modulator and demodulator under various changing parameters.
CO 2	To understand FM Modulation and Demodulation.
CO 3	Analyze various pulse modulation techniques.
CO 4	Simulate and conduct experiments on different types of Analog communication subsystems.

Lab Experiment List:

Expt. No	Name of Experiment
1	To study the Generation of Amplitude Modulation using transistor. Calculate modulation index for value of modulating amplitude.
2	To study the Generation of Amplitude Demodulation using Envelop Detector.
3	To study the Generation of Frequency Modulation using IC 8038 function generator.
4	To perform Frequency Demodulation using Foster Seeley Detector.
5	Generation of Pulse Amplitude Modulation using IC 555 & IC 4016.
6	Generation of PWM signal using IC 555.
7	Generation of PPM signal using IC 555.
8	Generation of Pulse Code Mudulation.
9	To perform Time Division Multiplexing (TDM).

IV Semester
IIOT2259: Design Tool Lab-1

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Students Will able to identify different Electronics Components.
CO 2	Students Will be able to work in teamwork
CO 3	Students Will be able to do Artwork, printing, etching & drilling of PCB
CO 4	Students will be able to do mini projects to enhance their practical Knowledge.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	1	1	--	--	--	--	--	--	1	--	--	1	--	--
CO -2	2	3	--	--	2	--	--	--	1	--	--	1	--	--
CO -3	3	3	--	--	2	--	--	--	1	--	--	1	--	--
CO -4	3	3	3	--	3	--	--	--	1	--	1	1	--	--
CO -5	--	--	--	--	3	--	--	--	1	--	1	1	--	--
Average														

Experiment List

Expt No.	Name of Experiment
1	Identification of Various electronic components used in electronics workshop
2	Identification of various equipment used in electronics workshop
3	Testing of various electronics components
4	Soldering and De-Soldering Practice
5	PCB Design using EDA Tools (Orcad Layout Plus /Allegro/ Multisim Ultiboard / EasyEDA / Express PCB)
6	Etching and fabrication
7	Report Writing

IV Semester
IIOT2260: Lab.: Electronics Workshop

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	**Understand** and identify Different Electronics Components.
CO 2	**Apply** the basic knowledge of Electronics Components to select the mini project.
CO3	**Demonstrate** their practical Knowledge to do Artwork, printing, Etching & drilling of PCB for mini project.
CO4	**Build** a mini project and **prepare** a report &small video.

Lab Experiment List:

Expt. No	Name of Experiment
1	Introduction to Various electronic components.
2	Study of various equipment used in electronics workshop.
3	Soldering and De-Soldering Practice of different components on PCB
4	Study of PCB and PCB design process.
5	Mini Project(Assembling electronic circuit on PCB and testing it.)
6	Simulation of electronic circuit using simulation software and Report Writing.

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2021

5th Semester

(Department of Electronics Engineering

Industrial Internet of Things (IIoT)

SoE No.
IoT-203.1

B.TECH SCHEME OF EXAMINATION 2021-22

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electronics Engineering)

Industrial IOT

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
Fifth Semester															
1	5	PC	EE	IIOT2301	IoT Communication Network	T	3	0	0	3	3	30	20	50	3 Hours
2	5	PC	EE	IIOT2302	Microcontroller & its Applications	T	3	0	0	3	3	30	20	50	3 Hours
3	5	PC	EE	IIOT2303	**Lab. :** Microcontroller & its Applications	P	0	0	2	2	1		60	40	
4	5	PC	EE	IIOT2304	Data Analytics	T	3	0	0	3	3	30	20	50	3 Hours
5	5	PC	EE	IIOT2305	**Lab.:** Data Analytics	P	0	0	2	2	1		60	40	
6	5	PC	EE	IIOT2306	Object Oriented Programming	T	3	0	0	3	3	30	20	50	3 Hours
7	5	PC	EE	IIOT2307	**Lab.:** Object Oriented Programming	P	0	0	2	2	1		60	40	
8	5	PC	EE	IIOT2308	CNC and Robotics	T	3	0	0	3	3	30	20	50	3 Hours
9			EE		**Professional Elective-I ***	T	3	0	0	3	3	30	20	50	3 Hours
10	5	STR	EE	IIOT2310	Industrial Visit	P	0	0	0	0	1		60	40	
					TOTAL FIFTH SEM		**18**	**0**	**6**	**24**	**22**				

List of Professional Electives-I *

Professional Electives -I

1	5	PE-I		IIOT2311	System C Progrming
2	5	PE-I		IIOT2312	Industry 4.0 and Smart Systems
3	5	PE-I		IIOT2313	Advanced Microprocessor

Audit Courses

1	5	HS		AU2126	YCCE Communication Aptitude Preparation (YCAP5.1) for CV,ME,CT,IT,CSE, IIoT, AIDS, CSD, AIML	A	3	0	0	3	0	

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

TA = for Practical : MSPA will be 15 marks each**

		June 2022	**1.01**	**Applicable for AY 2022-23 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

V Semester
IIOT2301: IoT Communication Network

Course Objective:

1. To understand the basic concepts of data communication, layered model, protocols and interworking between computer networks and switching components in telecommunication systems.
2. To learn basic concepts of internetworking, addressing, routing, concepts and techniques in error detection and correction.
3. An overview of security issues related to data communication in networks

Course Outcome: After completion of the course, student will demonstrate the ability to

CO1	Understand and explain the concept of Data Communication and networks, layered architecture and their applications, transmission Media, Media Access Control Wireless LAN, Network Connecting Devices in Computer Networks.
CO2	Demonstrate Data Link Layer Protocols, Routing Algorithms, congestion Control, TCP/IP protocol, IP addressing.
CO3	Describe design application layer protocols and internet applications such as Electronic Mail, and File Transfer, WWW and HTTP and DNS.
CO4	Explain Cryptography, Digital Signature, Entity Authentication, FIREWALLS, SSL Services

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	3	-	-	-	-	-	-	1	-	-	-	2	-	-
CO	-	2	-	-	-	-	-	1	-	-	-	2	-	-
CO	3	1	3	-	-	-	-	1	-	-	-	2	-	-
CO	2	2	-	-	-	-	-	1	-	-	-	2	-	-

Syllabus:

Unit	Content	Hours
1	Introduction, network and services: communication network, approaches to network design, types of network, two stage and three stage network. Uses of computer networks, LAN, MAN, WAN, design issues for layers, connection oriented and connectionless services, service primitives, Application and layered architecture, OSI reference model.	7

2	Physical layer and medium access layer:Guided transmission media, Unguided transmission media, multiple access protocols, IEEE standard 802 for LAN and MAN, high speed LANS, repeaters, hubs, bridges, fast Ethernet, Wireless LAN	8
3	Data link layer: .Data link layer design issues, Framing, error detection and correction methods, , Flow Control ,elementary data link protocols, sliding window protocols.	7
4	Network layer and transport layer: network layer design issues, routing, congestion, internetworking, transport layer design issues, transport service primitives, internet transport protocol, TCP/IP architecture, TCP/IP protocol, IP packets, IP addressing, TCP/IP utilities ,wireless TCP and UDP, routers and gateways	8
5	Application layer: Domain name system, electronic mail system, Remote Logging and File Transfer, WWW and HTTP, Multimedia.	7
6	Security: Cryptography,e-mail security, web security, communication security,Digital Signature Entity Authentication, FIREWALLS, SSL Services	8

Text Books:

SN	Title	Edition	Authors	Publisher
1	Data Communications and Networking	5th	Behrouz a Forouzan	Tata Mc. Graw Hill
2	Computer Networks	5th	Tanenbaum	Prentice Hall

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Data and Computer Communication	8th	W. Stallings	Prentice Hall

Website / Data sheet:

SN	Title
1.	https://www.tutorialspoint.com/digital_communication/digital_communication_quick_guide.htm
2.	https://www.javatpoint.com/digital-communication
3.	https://nptel.ac.in/courses/106/105/106105080/
4.	https://nptel.ac.in/courses/106/106/106106091/
5.	https://www.researchgate.net/publication/228597739_Computer_Communication_Networks-Lecture_Notes
6.	http://103.152.199.179/YCCE/yccelibrary.html

V Semester
IIOT2302: Microcontroller & its Applications

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	**Describe** the architecture of 8051, its features and instructions
CO 2	Write program for specific task
CO 3	Analyze and Interface the peripherals to 8051 microcontroller
CO 4	Develop application using 8051 microcontroller
CO 5	Write program and Debug using IDE tool like KEIL uVision5

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2						1	1	1		1	2	
CO 2	3	2						1	1	1		1	2	
CO 3		3	2					1	1	1		1		3
CO 4			3	2				1	1	1		1		3
CO 5				2	3			1	1	1		1		3

Syllabus:

Unit	Content	**Hours**
Unit:1	Overview of 8051 Microcontroller family, Introduction to MCS51 family, Architecture, Memory organization, Internal RAM, Flag Register, Register Banks, SFRs , Functional pin description and various resources of MCS 51,Hardware Overview, Addressing modes, Instruction set.	**7 Hours**
Unit:2	Branching instructions, Bit manipulation instructions, Assembly language Programs., 8051 I/O programming, Logic operations, Data conversion programs, Lookup table access	**7 Hours**
Unit:3	Delay Programs. 8051 programming in C:Data types and time delay, I/O programming, I/O Interfacing and programming for LED, switches, 7 segment display.	**7 Hours**

Unit:4	Timer programming in assembly and C: Various timer operations. SFR related to timer operation. Serial Port programming in assembly and C: Basics of serial communication, RS 232. Serial data transfer programs.	**7 Hours**
Unit:5	Interrupts Control, Interrupts programming in assembly and C, programming timer interrupt, external interrupt, serial interrupt. Interfacing and programming for LCD.	**7 Hours**
Unit :6	Keyboard matrix programming, Interfacing of ADC, DAC, stepper motor and programming. Interfacing RTC, EEPROM using I2C Bus and programming	**7 Hours**
	Total Lecture Hours	**42 Hours**

Textbooks	
1	**The 8051 Microcontroller and Embedded System, by M. A. Mazidi, Prentice Hall**
2	**The 8051 Microcontroller, by Kenneth J. Ayala, West Publishing Company**
Reference Books	
1	"The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2	"Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/yccelibrary.html
2	
MOOCs Links and additional reading, learning, video material	
1	https://www.keil.com/dd/docs/datashts/atmel/at89c51_ds.pdf
2	https://www.electronicwings.com/
3	https://www.tutorialspoint.com/microprocessor/microcontrollers_8051_architecture.htm
4	https://nptel.ac.in/courses/108/105/108105102/

V Semester
IIOT2303: Lab.: Microcontroller & its Applications

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	**Describe** the architecture of 8051, its features and instructions
CO 2	Write program for specific task
CO 3	**Analyze** and Interface the peripherals to 8051 microcontroller
CO 4	**Develop** application using 8051 microcontroller
CO 5	Write program and Debug using IDE tool like KEIL uVision5

Lab Experiment List:

Sr. No.	Name of Experiment
1	Write program to perform arithmetic and logical operation of two nos.
2	2.a: X and Y are two 8 bit nos. present in memory location 40H and 41H. Write program to perform X + Y and store result in M. L. 50H 2.b: X and Y are two 8 bit nos. present in memory location 60H and 61H. Write program to perform X - Y and store result in M. L. 70H
3	Five 8 bit nos. are present from M. L. 40H onwards. Write program to add these nos. and store result in M. L. 50H
4	Ten 8 bit nos. are present from M. L. 40H onwards. Write program to find the greatest no. and store result in M. L. 60H
5	6.a.: Interface LED with 8051 i/o pin P1.4 and write program to blink LED (ON/ OFF duration 1 sec) 6.b: Interface 8 LED's with 8051 i/o pin P1 and write program to turn ON alternate LED.
6	Interface 8 LED's with 8051 i/o pin P1 and write program to turn ON LED one by one from P1.0 to P1.7 after a delay of 1 sec
7	Interface LED with 8051 i/o pin P1.4 and switch with P1.1. Write program to turn on LED if switch is pressed
8	Interface common cathode 7 segment display to P2 of 8051 and write program to display 0 to 9 continuously at an interval of 3 sec.
9	Write program to send "ABC" via serial port of 8051 with 9600 baud rate
10	Interface 2X16 LCD with 8051.Use 8 bit data length and write program to display "HI FRIENDS " in first line from first position. Use P2 for data pins and P0 for control pins

V Semester
IIOT2304: Data Analytics

Course Objective:

- To acquaint the students with data analytic tools
- To acquaint the students with data attributes and data analytics lifecycle
- To familiarize the students with data visualization tools
- To familiarize the students with importance of big data and associated technologies.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Concept of different types of data and its analytics.
CO 2	Understand how the data analysis will be done.
CO 3	Apply the different techniques for data cleaning and visualization.
CO 4	Analyse the Big Data and obtain insight using data analytics mechanisms.
CO 5	Analyse the Data analytics concepts using latest software.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	-	-	2	-	-	-	-	-	-	1	-	-
CO 2	2	2	-	-	2	-	-	-	-	-	-	1	-	-
CO 3	2	1	-	-	2	-	-	-	-	-	-	1	2	-
CO 4	1	-	-	-	2	-	-	-	-	-	-	1	2	-
CO 5	-	-	-	-	3	-	-	1	1	1	-	1	2	2

Syllabus:

Unit	Content	Hours
1	**Working with Data:** Defining Data, Understanding Various Data Types and Structures, Structured Data, Unstructured Data, Characteristics of Data, The History of Data Analytics, Data Analytics vs. Data Analysis, Business Intelligence vs. Data Analytics, The Business Use of Data Analytics, Data Analytics Tools	
2	**Exploring Types of Data Analytics:** Descriptive Analytics, Making Use of Descriptive Analytics, Inferential Statistics in Descriptive Analytics, Diagnostic Analytics, Predictive Analytics, **Data Analytics Lifecycle**: Data Preparation, Model Planning, Model Building, Communicating the Outcomes, Operationalize	

3	**Data Cleaning:** The Common Component in Data Cleansing, Detecting Outliers With Uni-Variate and Multi-Variate Analysis, Extreme Values Analysis, Understanding Probability and Inferential Statistics, Probability Distributions, Common Attributes of Probability, Calculating and Measuring Correlation	
4	**Data Visualization:**Understanding Data Visualization, Data Storytelling For Corporate Decision-Makers, Data Visualization For Analyst, Building Data Art for Activists, Picking the Most Suitable Design Style, Creating a Numerical, Reliable Response, Choosing the Best Data Graphic Type For Your Visualization, Standard Chart Graphics, Comparative Graphics Statistical Plots, Some Popular Data Visualization Tools	
5	**Evolution of Big Data:** Definition of Big Data, Challenges with Big Data, what is Big Data? Why Big Data? Traditional Versus Big Data approach, Big Data framework Big Data Analytics – What is Big Data Analytics? Classification of Analytics, Top Challenges Facing Big Data.	
6	**Hadoop:** What is Hadoop. Core Hadoop Components, Hadoop Ecosystem, Hadoop Limitations.	
	Total Lecture Hours	

Text Books:

SN	Title	Edition	Authors	Publisher
1	DATA ANALYTICS A Comprehensive Beginner's Guide To Learn About The Realms Of Data Analytics From A-Z	Kindle Edition	Benjamin Smith	Amazon Asia-Pacific Holdings Private Limited, 2021
2	DATA ANALYTICS Simple and Effective Tips and Tricks to Learn Data Analytics Effectively	Kindle Edition	Benjamin Smith	Amazon Asia-Pacific Holdings Private Limited, 2021
3	Big Data Analytics	Second	RadhaShankarmani, M Vijayalakshmi	Wiley 2017

Reference Books:

SN	Title	Edition	Authors	Publisher
1	DATA ANALYTICS Advanced Guide to Learn the Realms of Data Analytics Effectively	Kindle Edition	Benjamin Smith	Amazon Asia-Pacific Holdings Private Limited, 2021
2	DATA ANALYTICS-Made Accessible	First Edition	Dr.AnilMaheshwari	--
3	Big Data Analytics with R and Hadoop	First Edition	VigneshPrajapati,	Packt Publishing 2013

Website / Data sheet:

SN	Title
1	https://collegedunia.com/courses/data-analytics/syllabus
2	https://www.mastersindatascience.org/learning/what-is-data-analytics/

V Semester
IIOT2305: Lab.: Data Analytics

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Understand the concept of different types of data and its analytics.
CO 2	Understand how the data analysis will be done.
CO 3	Apply the different techniques for data cleaning and visualization.
CO 4	Analyse the Big Data and obtain insight using data analytics mechanisms.
CO 5	Analyse the Data analytics concepts using latest software.

Lab Experiment List:

Expt. No	Name of Experiment
1	Introduction to Python tool for data analytics science
2	Data Pre-processing
3	Data Analysis
4	Data Preparation
5	Data Cleaning
6	Data Visualization
7	Types For Data Visualization
8	Decision Trees
9	Downloading and installing Hadoop; Understanding different Hadoop modes. Start-up scripts, Configuration files.
10	Hadoop Implementation of file management tasks, such as Adding files and directories, Retrieving files and Deleting files

V Semester
IIOT2306: Object Oriented Programming

Course Objective:

- To acquaint the students with concept of object oriented programming
- To acquaint the students with various concepts of OOP
- To familiarize the students with various data structures and their programming
- To familiarize the students with file handling concepts

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Understand the concept of concepts of Object-Oriented Programming
CO 2	Analyze the using the concept of Inheritance, Polymorphism, Overloading
CO 3	Choose the appropriate data structure and algorithm design method for a specified application
CO 4	Develop and use linear and non-linear data structures
CO -5	Create software solutions for complex problems

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	1	3	1	1	1	--	--	--	1	--	1	1	--	--
CO -2	1	3	3	3	2	--	--	--	1	--	1	1	--	--
CO -3	3	3	3	3	3	--	--	--	1	--	1	1	--	--
CO -4	3	2	3	--	--	--	--	--	1	--	1	1	--	--
CO -5	--	--	--	--	3	--	--	--	3	--	--	--	--	--

Syllabus:

Unit No.	Content	Max. Hrs.
1	Principles of Object Oriented Programming (OOP), Software Evaluation, OOP Paradigm, Basic Concepts of OOP, Benefits of OOP, Application of OOP	**7**
2	Introduction to C++, Tokens, Keywords, Identifiers, Variables, Operators, Manipulators, Expressions and Control Structures, Pointers, Functions, Function Prototyping Parameters Passing in Functions, Values Return by Functions, Inline Functions, Friend and Virtual Functions	**7**

3	Classes and Objects, Constructors and Destructors, Operator overloading, Type of Constructors, Function Overloading, Inheritance, Types of Inheritance Virtual Functions and Polymorphism	**7**
4	Definition of a data structure, Primitive and Composite data types, Asymptotic notations, Arrays, Operations of Arrays, Order lists, Stacks, Applications of Stack, Infix to Postfix Conversion, Recursion, Queues, Operations of Queues. (7 Hours)	**7**
5	Singly linked list, Operations, Doubly linked list, Operations, Trees and Graphs: Binary tree, Tree traversal; Graph, Definition, Types of Graphs, Traversal (BFS & DFS), Dijkstra`s algorithm	**7**
6	Files, classes for file stream operations, Opening, Closing and Processing files, End of file detection , File pointes, Updating a file , Error Handling during file operations, Command line arguments, Templates, Exception Handling	**7**
	Total Lecture Hours	**42**

Text Books

SN	Title	Edition	Authors	Publisher
1	Object Oriented Programming with C++	4th Edition,2008	E. Balagurusamy	TMH

Reference Books

SN	Title	Edition	Authors	Publisher
1	Object Oriented Programming in Microsoft C++	Third Edition, 2003	Robert Lafore	Galgotia Publications
2	Fundamentals of Data Structures in C++	2002	E. Horowitz and S.Shani	Galgotia Publications
3	Computer algorithms	2008	Horowitz, S.Shani and S.Rajasekaran	Galgotia Publications

Website / Data sheet:

SN	Title
1	https://www.w3schools.com/cpp/cpp_oop.asp
2	https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/
3	http://103.152.199.179/YCCE/yccelibrary.html
4.	https://archive.nptel.ac.in/courses/106/105/106105224/
5.	https://archive.nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs48/

V Semester
IIOT2307: Lab.: Object Oriented Programming

Course Objective:

- To acquaint the students with concept of object oriented programming
- To acquaint the students with various concepts of OOP
- To familiarize the students with various data structures and their programming
- To familiarize the students with file handling concepts

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Understand the trade-offs of algorithms and programming aspects
CO 2	Apply various operation on data Structure
CO 3	Analyze various types of Data Structure
CO 4	Implement various types of algorithms and analyze performance of system
CO 5	Develop programs using data structures and latest compilers

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	1	1	--	--	--	--	--	--	1	--	--	1	--	--
CO -2	2	3	--	--	2	--	--	--	1	--	--	1	--	--
CO -3	3	3	--	--	2	--	--	--	1	--	--	1	--	--
CO -4	3	3	3	--	3	--	--	--	1	--	1	1	--	--
CO -5	--	--	--	--	3	--	--	--	1	--	1	1	--	--
Average														

Experiment List

Expt No.	Name of Experiment
1	Implement the concept of Class and its data members and member functions in C++
2	Implement the concept of function and operator overloading in C++
3	Implement the concept of friend function
4	Implement the concept of class constructor and its type in C++
5	Implement the concept of Abstraction in C++
6	Implement the concept of all types of inheritance in C++
7	Implement the concept of run time polymorphism in C++
8	Implement the concept of Files using command line arguments in C++
9	Implement the concept of function templates and class template in C++
10	Implement the concept of exception in C++

V Semester
IIOT2308 : CNC and Robotics

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Understand working of subtractive manufacturing
CO 2	Implement CNC programs for various product manufacturing
CO 3	have knowledge of Robotics, automation, robotics motion, sensors, robotic programming and roles of robots in industry
CO 4	Understand the working methodology of robotics and automation, motion and control, machine vision and programming, application of robots in industry

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	2	2	3	1	1					1	1	1
CO 2	3	3	3	2	2	1						1	1	1
CO 3	3	2	3	3	3	1	1					1	1	1
CO 4	3	3	2	3	2	1						1	1	1

Syllabus:

Unit	Content	Hours
1	Concepts of NC, CNC, DNC. Classification of CNC machines, MCU architecture and functionality, Machine Configurations, Types of control, CNC controller's architecture and characteristics, Interpolators.	7
2	Positioning system, Cutter offset compensation, Word address format, Introduction to G and M codes Manual part programming for CNC turning, milling and drilling.	8
3	Tooling system for Machining center and Turning center, work holding devices, of CNC Machines. APT part programming, CAD/CAM programming, Simulation and Verification of CNC programs, Adaptive CNC control techniques. Integration of CNC machines for CIM	8
4	**FUNDAMENTALS OF ROBOT** Robot – Definition – Robot anatomy – Co-ordinate systems, work envelope, types and classification – Specifications – Pitch, yaw, roll, joint notations, speed of motion and pay load – Robot parts and their functions – Need for robots – Different applications..	7

5	**ROBOT PROGRAMMING** Teach pendant programming – Lead through programming – Robot programming languages – VAL programming – Motion commands – Sensor commands – End effecter commands – Simple programs.	8
6	**IMPLEMENTATION** Implementation of robots in industries, Robotics for Automotive sector, Material handling system, medical applications, precision manufacturing system	7
	Total Lecture Hours	45

Text Books:

SN	Title	Edition	Authors	Publisher
1	Robot Engineering An Intergrated approach	2004	Klafter R.D., Chmielewski T.A. and Negin M	Springer
2	Industrial Robotics: Technology, Programming and Applications,	2012	Mikell P. Groover, Mitchel Weiss, Roger N. Nagel, Nicholas G. Odrey and AshishDutta	2ndEdition, Tata McGraw Hill, 2012.
3	Automation in Production system	2002	Mikell P. Groover	Prentice-Hall of India Pvt. Ltd., New Delhi, 2002

Reference Books:

SN	Title	Edition	Authors	Publisher
1	CNC Technology and Programming	2003	Krar, S., and Gill	Industrial Press Inc
2	An Introduction to CNC Machining	1991	Gibbs, D.	Industrial Press
3	Computer Numerical Control Concepts and Programming	1991	Seames, W.S.	Thomson Learning EMEA, Limited
4	Computer Numerical Control for Machining	1993	Lynch, M	McGraw-Hill
5	Computer Control of Manufacturing Systems	2005	Koren Y	Tata McGraw-Hill Education
6	Robotics control, sensing, vision, and intelligence	2004	Fu K.S., Gonzalez R.C., and Lee CSG	Tata McGraw-Hill Education
7	Robotics Technology and Flexible Automation	2001	Deb S.R	Tata McGraw-Hill Education
8	Introduction to Robotics Mechanics and Control	2008	Craig J.J	Pearson Education India

Links for E books in YCCE LIBRARY

SN	Link
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042
3	

Links for online courses including SWAYAM / NPTEL/ COURSERA/ UDEMY

SN	Link
1	https://nptel.ac.in/courses/112102103
2	https://nptel.ac.in/courses/112105249
3	https://nptel.ac.in/courses/112105211

V Semester
IIOT2311 : PE-I - System C Progrming

Course Objective:

- To familiarize the students with testing methodology
- To acquaint the students with various modeling technique in verification
- To acquaint the students with use of testbenches

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Understand the design methodology
CO 2	Describe the concepts of combinational modeling
CO 3	model synchronous circuits and testbenches
CO 4	Verify the functionalities

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	2	2	2	2	3	1	1					1	1	1
CO -2	2	2	2	2	2	1						1	1	1
CO -3	2	2	2	3	3	1	1					1	1	1
CO -4	2	2	2	3	2	1						1	1	1
Average	2	2	2	2	3	1	1					1	1	1

Syllabus:

Unit No.	Content	Max. Hrs.
1	Design methodology, capabilities, SystemC RTL, Verifying functionality, Value holders, summary of types , bit types	**7**
2	Data types, bit types, arbitrary width type, logic types, arbitrary width types, singed integer types, precision signed integer, user defined data types	**7**
3	Modelling of combinational logic, reading and writing ports and signals, logical operators, arithmetic operators, relational operators, vectors and ranges, if statement , switch statement , loops, methods, structures, multiple processes and delta delay	**7**

4	Modelling of synchronous logic, modelling of flip-flops, multiple processes, FF with asynchronous and asynchronous preset and clear, Multiple and multi phase clocks, modelling latches,	**7**
5	Three state drivers, multiple drivers, handling don't cares, hierarchy , parametrizing modules, variables and signal assignments, memory model, FSM , Universal shift registers, counters, Johnson decoder, factorial model	**7**
6	Writing testbences , simulation controls, waveforms, monitoring behaviour , tracing aggregate types, constructor arguments, GCD and Filter examples, advanced topics	**7**
	Total Lecture Hours	42

Text Books

SN	**Title**	**Edition**	**Authors**	**Publisher**
1	SystemC Primer	First Edition	J. Bhaskar	Star Galaxy Publications
2	SystemC: From the Ground Up	Second edition	David C. Black, Jack Donovan, Bill Bunton, Anna Keist	Springer

Reference Books

SN	**Title**	**Edition**	**Authors**	**Publisher**
1	System Design with SystemC		Grötker, T., Liao, S., Martin, G., Swan, S	springer

Website / Data sheet:

SN	**Title**
1	https://www.learnsystemc.com/
2	https://www.doulos.com/training/systemc-tlm-20/comprehensive-systemc/

Links for E books in YCCE LIBRARY

SN	**Link**
1	http://103.152.199.179/YCCE/yccelibrary.html

Links for online courses including SWAYAM / NPTEL/ COURSERA/ UDEMY

SN	Link
1	https://www.udemy.com/course/system-programming/

V Semester
IIOT2312 : PE-I - Industry 4.0 and Smart Systems

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Articulate the recent manufacturing trends related to Industry 4.0 and its implementation
CO 2	Interpret concepts and basic framework necessary for smart manufacturing
CO 3	Develop understanding about harnessing smartness into manufacturing processes from the data
CO 4	Able to find the applications of all the areas in day to day life.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	3	2	1					1	1	1	1	1
CO 2	3	3	3	2		1						1	1	1
CO 3	3	2	3	2	2						1		1	1
CO 4	3	3	2	2		1				1		1	1	1

Syllabus:

Unit	Content	Hours
1	**Introduction to Industry 4.0** The Various Industrial Revolutions, Digitalization and the Networked Economy, Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0, The Journey so far: Developments, Comparison of Industry 4.0 Factory and Today's Factory, Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation	8
2	**Road to Industry 4.0** Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services, Smart Devices and Products, Smart Logistics, Smart Cities, Predictive Analytics	7
3	**Related Disciplines, System, Technologies for enabling Industry 4.0** Cyber physical Systems, Robotic Automation and Collaborative Robots, Support System for Industry 4.0, CNC and FMS system integration	7
4	**Smart Manufacturing** Introduction to manufacturing processes and systems; Industrial revolutions, Background and concept of smart manufacturing. Models and key technologies for smart technologies, Automated manufacturing processes, Elements of smart manufacturing process; sensing elements and IoT technologies	8

5	**IoT Applications and Tools of Industry** Applications of IoT: Manufacturing, Healthcare, Education, Aerospace and Defence, Agriculture, Transportation and Logistics, Impact of Industry 4.0 on Society: Impact on Business, Government and People. Tools for Artificial Intelligence, Big Data and Data Analytics, Virtual Reality, Augmented Reality, IoT, Robotics	8
6	Business issues in Industry 4.0, Opportunities and Challenges, Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world	7
	Total Lecture Hours	45

Text Books:

SN	Title	Edition	Authors	Publisher
1	Cloud Based Cyber-Physical Systems in Manufacturing,	2019	Wang L, and Vincent W X,	Springer.
2	Digital Twin Driven Smart Manufacturing	2019	Tao F, Zhang M, and Nee A Y C,	Academic Press.

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Industrial Internet of Things – Cyber manufacturing Systems,	2017	Jeschke S, Brecher C, Song H, and Rawat D B,	Springer
2	Designing the Internet of Things	2013,1st edition,	A. McEwen and H. Cassimally	Wiley

Links for E books in YCCE LIBRARY

SN	Link
1	https://ebooks.wileyindia.com/explore;searchText=INDUSTRY%204.0;mainSearch=1;themeName=Default-Theme
2	https://link.springer.com/search?query=INDUSTRY+4.0&facet-content-type=Book

Links for online courses including SWAYAM / NPTEL/ COURSERA/ UDEMY

SN	Link
1	https://nptel.ac.in/courses/106105195
2	https://www.classcentral.com/course/udemy-arduino-proteus-pcb-design-iot-industry-40-87630

V Semester
IIOT2313 : PE-I - Advanced Microprocessor

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Describe the architecture of Microprocessor
CO 2	Write Program for an assigned task.
CO 3	Apply different address decoding techniques while interfacing Memory to Microprocessor
CO 4	Analyze and Design interfacing of Peripheral devices to Microprocessor

CO – PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	3	3	2	2	3	1	1					3	3
CO2	3	3	2	2	3	1	1					2	3
CO3	3	3	2	2	3	1	1	2	2	2	1	3	3
CO4	3	3	2	2	3	1	1	2	2	2	1	2	3

Syllabus:

Unit	Content	Hours
1	**Microprocessor organization** Introduction to Microprocessor based systems, Register Organization and Architecture and Signal Description of 8086	6
2	**8086 Instruction set and Programming Concepts** Machine Language Instruction formats for 8086, addressing modes and assembler directives, Basic programming	7
3	**8086: Special Processor activities** Processor RESET and Initialization, HALT, TEST and synchronization with External signals, Subroutine instructions like CALL, PUSH, POP, Programs based on instructions.	7
4	**Concepts of Memory & IO Interfacing** Basics of Memory and I/O Interfacingwith 8086, Types of decoding techniques.	6
5	**Interfacing of basic Peripherals** Programmable peripheral Interface 8255- Block Diagram, Pin functions, Different Modes of operation& Interfacing with 8086	6
6	**Special Purpose Programmable Peripheral devices and their interfacing** Interfacing of Programmable Interval Timer 8253 and Programmable Communication Interface 8251 USART with 8086	7
	Total Lecture Hours	39

		June 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Text Books:

SN	Title	Edition	Authors	Publisher
1	Advanced Microprocessors and Peripherals	-	A K Ray, K. M. Bhurchandi	Tata McGraw Hill Publishing

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Microprocessors & interfacing	2'nd Edition	D. V. Hall	Tata Mc-Graw Hill
2	Microprocessor 8086: Architecture, Programming and Interfacing	-	Sunil Mathur	pHI publications

Links for online courses including SWAYAM / NPTEL/ COURSERA/ UDEMY

SN	Link
1	Nptel Video:https://www.youtube.com/watch?v=0t4LROuEVnw&list=PLwdnzlV3ogoXgNjr_oe5cWQIbf72ZY4Zf
2	https://www.youtube.com/watch?v=oRPluYsxF28&list=PLuv3GM6-gsE01L9yDO0e5UhQapkCPGnY3&index=7
3	https://www.electronicwings.com/

V Semester
IIOT2310 : Industrial Visit

V Semester
(Audit Course)
AU2126 : YCCE Communication Aptitude Preparation (YCAP5.1)

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2021

6th Semester

(Department of Electronics Engineering

Industrial Internet of Things (IIoT)

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.TECH SCHEME OF EXAMINATION 2021-22

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electronics Engineering)

Industrial IOT

SoE No. IoT-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours L	T	P	Hrs	Credits	% Weightage MSEs*	TA**	ESE	ESE Duration Hours
Sixth Semester															
1	6	PC	EE	IIOT2351	Digital System Design	**T**	3	0	0	3	3	30	20	50	3 Hours
2	6	PC	EE	IIOT2352	**Lab.:** Digital System Design	**P**	0	0	2	2	1		60	40	
3	6	PC	EE	IIOT2353	Embedded System Design	**T**	3	0	0	3	3	30	20	50	3 Hours
4	6	PC	EE	IIOT2354	**Lab.:** Embedded System Design	**P**	0	0	2	2	1		60	40	
5	6	PC	EE	IIOT2355	Data Acquisition & Signal Conditioning	**T**	3	0	0	3	3	30	20	50	3 Hours
6	6	PC	EE	IIOT2356	Machine Learning for IIoT	**T**	3	0	0	3	3	30	20	50	3 Hours
7	6	PC	EE	IIOT2357	**Lab.:** Machine Learning for IIoT	**P**	0	0	2	2	1		60	40	
8	6	PC	EE	IIOT2358	Design Tool **Lab-2**	**P**	0	0	2	2	2		60	40	
9	6	PC	EE	IIOT2359	Cryptograpghy for IIoT	**T**	3	0	0	3	3	30	20	50	3 Hours
10	6	PE	EE		**Professional Elective-II**	**T**	3	0	0	3	3	30	20	50	3 Hours
11	6	PE	EE		**Lab: Professional Elective-II**	**P**	0	0	2	2	1		60	40	
					TOTAL SIXTH SEM		**18**	**0**	**10**	**28**	**24**				

List of Professional Electives- II

Professional Electives-II

1	6	PE-II	EE	IIOT2361	PE-II Digital Image processing
	6	PE-II	EE	IIOT2362	PE-II: **Lab.:** Digital Image processing
2	6	PE-II	EE	IIOT2363	PE-II Flexible Manufacturing System
	6	PE-II	EE	IIOT2364	PE-II: **Lab: :** Flexible Manufacturing System
3	6	PE-II	EE	IIOT2365	PE-II Digital Signal Processing
	6	PE-II	EE	IIOT2366	PE-II **: Lab:** Digital Signal Processing

Audit Courses												
1	6	HS		AU2130	YCCE Communication Aptitude Preparation (YCAP6.3) for CT, IT, CSE, IIoT, AIDS, CSD, AIML	**A**	3	0	0	3	0	

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

TA = for Practical : MSPA will be 15 marks each**

		June 2022	**1.01**	**Applicable for AY 2022-23 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

VI Semester
IIOT2351: Digital System Design

Course Objective:

- Expose students to the advanced design techniques and methodology and industrial standard EDA tools in Digital Circuits and Systems design

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Understand hardware description language and able to design and simulate digital systems using different abstraction levels
CO 2	Design and analyse combinational and sequential logic circuits.
CO 3	Understand and apply timing issues in multiple contexts and design the circuit.
CO 4	Understand programmable devices and able to design digital systems using modern design tools

Syllabus:

Unit	Content	Hours
1	HDL Based Design flow, Requirements of HDL, Design Methodologies, Different Modelling styles, Introduction to Verilog, Elements of Verilog, Verilog Module definition, Elements of Module ,Basic Concepts in Verilog, Reserved Keywords, Syntax & Semantics, Comments, Identifiers, Number Representation, System Representation, Verilog Ports, Verilog Data Types, Wire & Variables, Physical & Abstract, Constants, Parameter, Verilog Data Operators.	8
2	Data Flow Modeling, Delay, Continuous Assignment, Delayed Continuous assignment Design entry in Verilog & Test bench, Combinational blocks design, Compilation and synthesis, Timing analysis resolving signal values	7
3	Structural Modeling Feature, Module Instantiation, Gate level Primitives, Gate Delays, Switch Level Primitives, User Defined Primitives.	7
4	Behavioral Modeling, Initial, Always, Procedural Assignment, Sequential & Parallel Blocks, Timing Control, Procedural Statements, Conditional Statements, if case loop repeat forever etc, Event Based Timing Control, Latch Models, FF Models, State Machine Coding ,Moore and Mealy Machines.	8
5	Combinational & sequential system Design examples like Shift Registers, Counters, Barrel Shifters, Multi bit Adders , Multi bit Multiplier, Arithmetic Logic Unit.	8
6	Digital Design Fundamentals, Combinational & Sequential design issues, Introduction to programmable devices, PLA, PAL, PROM, Structure of CPLDs, Introduction to FPGA, Architecture, CLB, IOB, Programmable Interconnect Points, Different type of programmable switches used in PLDs.	7
	Total Lecture Hours	45

Text Books:				
SN	**Title**	**Edition**	**Author**	**Publisher**
1	Verilog HDL : A Guide to Digital Design and Synthesis	2nd Edition	Samir Palnitkar	2003
Reference Book:				
	Title	**Edition**	**Author**	**Publisher**
1	Verilog Digital System Design	Second Edition	ZainalabedinNavabi	Tata McGraw Hill , 2009

Website / Data sheet:

SN	Title
1	https://www.chipverify.com/verilog/verilog-tutorial
2	https://www.asic-world.com/verilog/veritut.html
3	http://103.152.199.179/YCCE/yccelibrary.html
4	https://nptel.ac.in/courses/106105165 https://onlinecourses.nptel.ac.in/noc20_cs63/preview https://nptel.ac.in/courses/108103179 https://onlinecourses.nptel.ac.in/noc21_ee97/preview

VI Semester
IIOT2352: Lab.: Digital System Design

SN	Experiment Name
1.	Write Verilog Codes of basic gates using Bitwise Operator .Test it with test stimuli generated by test bench.
2.	Write Verilog Codes of 2:1 and 4:1 Multiplexer using Bitwise Operator .Test it with test stimuli generated by test bench.
3.	Write Verilog Codes of 2:4 and 3:8 Decoder using Bitwise Operator .Test it with test stimuli generated by test bench.
4.	Write Verilog Codes of half and full adder using Bitwise Operator .Test it with test stimuli generated by test bench.
5.	Write verilog code using conditional assignment statement. Test it with test stimuli generated by test bench.
6.	Write a Structural Verilog code of full adder using half adder. Test it with test stimuli generated by test bench.
7.	Write a Structural Verilog code of 4:1 multiplexer using 2:1 multiplexer. Test it with test stimuli generated by test bench.
8.	Write a Structural Verilog code of 4-bit Ripple carry Adder using full adder. Test it with test stimuli generated by test bench.
9.	Write a Behavioural Verilog code of multiplexers using if statements. Test it with test stimuli generated by test bench.
10.	Write Verilog code for Mealy and Moore sequence detector.(using overlapping allowed and not allowed)

Text Books:

Title	Edition	Author	Publisher
Verilog HDL : A Guide to Digital Design and Synthesis	2nd Edition	Samir Palnitkar	2003

Reference Book:

Title	Edition	Author	Publisher
Verilog Digital System Design	Second Edition	ZainalabedinNavabi	Tata McGraw Hill , 2009

VI Semester
IIOT2353: Embedded System Design

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Describe the ARM microprocessor architectures, its features and instructions
CO 2	Write program for specific task
CO 3	Analyze and Interface the peripherals to ARM based microcontroller
CO 4	Develop embedded system application using ARM based microcontroller
CO 5	Write program and Debug using IDE tool like KEIL MDK410 and Code Composer Studiofor ARM

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	3	2						1	1	1		1	2	
CO	3	2						1	1	1		1	2	
CO		3	2					1	1	1		1		3
CO			3	2				1	1	1		1		3
CO				2	3			1	1	1		1		3

Syllabus:

Unit	Content	Hours
Unit:1	Introduction to embedded system, Overview of Microprocessor, Microcontroller and ARM, RISC and CISC Architecture, ARM processor features, ARM architecture, ARM Modes.	7 Hours
Unit:2	ARM instruction set, ARM and Thumb mode, Assembly Language Programs	7 Hours
Unit:3	Stack operation, instructions, Control Transfer Instructions, Subroutine, Exceptions, Software Interrupt SWI, and Programs	7 Hours
Unit:4	Program array multiplication, Hardware ARM LPC 2148 pins and signals, PWM Program Interrupt pins Interrupt Handler, DC motor Control using PWM, DAC and ADC working principle	7 Hours

Unit:5	Interfacing and programing: I/O with Arduino / LPC2148/ MSP430 Ti Launchpad Interfacing of Switch, LED, and 7 segment display	7 Hours
Unit :6	Interfacing and programing: I/O with Arduino / LPC2148/ MSP430 Ti Launchpad. Interfacing of Sensors and Actuators, Sensors like LDR, Temp, Gas Sensor and LCD Design Application using ARM	7 Hours
	Total Lecture Hours	**42 Hours**

Textbooks	
1	ARM System–on-chip Architecture, by Steve Furber, Pearson Education Asia Publication
2	Embedded Linux, Hardware, Software and interfacing, by Craig Hallabaugh, Addison-Wesley Professional Publication

Reference Books	
1	ARM System Developer's Guide: Designing and Optimizing, by Sloss Andrew N, Symes Dominic & Wright Chris, Morgan Kaufman Publication
2	MSP 430 Data sheet, by Texas Instrument
3	LPC 2148 data sheet, by NXP (Philips

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/yccelibrary.html

MOOCs Links and additional reading, learning, video material	
1	https://www.arm.com/resources/education/education-kits/efficient-embedded-systems
2	https://www.electronicwings.com/
3	https://nptel.ac.in/courses/106/105/106105193/

VI Semester
IIOT2354: Lab.: Embedded System Design

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Describe the ARM microprocessor architectures, its features and instructions
CO 2	Write program for specific task
CO 3	Analyze and Interface the peripherals to ARM based microcontroller
CO 4	Develop embedded system application using ARM based microcontroller
CO 5	Write program and Debug using IDE tool like KEIL MDK410 and Code Composer Studiofor ARM

Lab Experiment List:

Sr. No.	Name of Experiment
1	a) Write program to perform addition of two16 bit nos. and store result in R5 b)Write program to perform subtraction of two 16 bitbit nos. and store result in R5
2	a)Write program to perform AND operation on two 16 bit nos. and store result in R6 b)Write program to perform OR operation on two 16 bit nos. and store result in R6 c)Write program to perform EOR operation on two 16 bit nos. and store result in R6
3	Write program to add two nos. x and y present in memory at address 4000000H and 40000004H and store in memory 40000008H
4	Write program to add Five 8 bit nos. present in memory from address 40000004H and store result in memory 4000 0030H
5	Write program to multiply data of two array zi = xi * yi · xi and yi are 32 bit nos · array1 (xi) stored from address 40000000H · array 2 (yi) stored from address 40000020H · no. of elements in array i = 5 · Store result array3 (zi) from address 40000040H
6	Compare two strings of 3 ASCII characters, One string starts at 0x40000000 and other at 0x40000010. If both the string match store 11H in memory location 0x40000030 otherwise store 22H in memory location 0x40000030.
7	Draw Interfacing of LED with LPC2148 and write program to blink LED connected to port pin P0.7 of LPC2148
8	Draw Interfacing of LED with LPC2148 and Write program to blink 8 LEDs alternately connected to port pins P1.16 to P1.23 of LPC2148

9	Draw Interfacing of common cathode 7 segment display with LPC2148 and write program to display 0 to 9 at an interval of 1 sec. 7 segment display is connected to port pins P1.16 to P1.23 of LPC2148.
10	Draw interfacing of LCD 16x2 with LPC2148 and write program to display your **FIRST NAME** in first line.

VI Semester
IIOT2355: Data Acquisition & Signal Conditioning

Course Objective:

- The course gives an overview about the data acquisition methods, to acquaint students with ADCs and DACs and various data acquisition techniques

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	**Understand** the Data acquisition system and Signal Conditioning Components.
CO 2	**Analyze** the Knowledge of Serial data Communication and interface standards.
CO 3	**Remember** the different boards and field buses used for data acquisition Systems.
CO 4	**Understands** the use of Ethernet, Medium Access control and USB

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	-	-	-	-	-	--	-	-	-	1	-	-
CO 2	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO 3	3	-	1	-	-	-	-	-	-	-	-	1	-	-
CO 4	3	2	2	-	-	-	-	-	-	-	-	1	-	-

Syllabus:

Unit	Content	Hours
1	Definition of data acquisition and control, Fundamentals of data acquisition, Signal conditioning, Data acquisition and control system configuration, Computer plug-in I/O, Distributed I/O, Stand-alone or distributed loggers/controllers, Analog and digital signals: Classification of signals, Sensors and transducers, Transducer characteristics, Resistance temperature detectors (RTDs), Thermistors, Thermocouples, Strain gauges, Wheatstone bridges.	7
2	Signal conditioning: Types and classes, Field wiring and signal measurement, Noise and interference, Minimizing noise, Shielded and twisted-pair cable.	6
3	Plug-in data acquisition boards, A/D Boards, Single ended Vs differential signals, Resolution, dynamic range and accuracy of A/D boards, Sampling rate and the Nyquist theorem, Sampling techniques, D/A boards, Digital I/O boards.	7

4	Serial data communications, Transmission modes – simplex and duplex, RS-232-C interface standard, RS-485 interface standard, Comparison of the RS-232 and RS-485 standards, Serial interface converters, Protocols, Error detection	7
5	IEEE 488 Standard, Introduction, Electrical and mechanical characteristics, Physical connection configurations, Device types, Bus structure, GPIB handshaking, Device communication, Requirements of IEEE 488.2 controllers, Standard commands for programmable instruments (SCPI).	6
6	Ethernet and field buses for data acquisition, Physical layer, Medium access control, Difference between 802.3 and Ethernet, The universal serial bus (USB), USB overall structure, Topology.	6
	Total Lecture Hours	**39 Hours**

Text Books:

SN	Title	Edition	Authors	Publisher
1	Data Acquisition for Instrumentation and Control Systems	10 June 2003	John Park and Steve Mackay	Elsevier

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Electronic Analog Digital Conversion	1 st Edition	H. Schmid	Tata McGraw Hill
2	Data Converters	1 st Edition, 1993	B. S. Sonde	Tata McGraw Hill

Website / Data sheet:

SN	Title
1	http://103.152.199.179/YCCE/yccelibrary.html
2	https://nptel.ac.in/courses/108/105/108105062

VI Semester
IIOT2356: Machine Learning for IIoT

Course Objective:
Students should be able to

- Understand the concepts of machine learning and regression models
- Understand the concept of classification for model evaluation.
- Learn Supervised and unsupervised learning algorithms.
- Learn the concept of artificial neural network and deep networks

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	**Apply** the knowledge of Mathematics and programming to build machine learning models
CO 2	**Analyze** different use cases to evaluate the performance of the models
CO 3	**Design and develop** application models using supervised and unsupervised learning algorithms
CO 4	**Compare** different machine learning techniques and **demonstrate the comprehension** of the trade-offs involved in design choices

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	3	3	1	1	1	-	-	-	-	-	-	3	-	-
CO -2	3	3	3	2	3	-	-	-	-	-	-	3	-	-
CO -3	**3**	**3**	**3**	**2**	**3**	**2**	-	**2**	-	**1**	-	**2**	-	-
CO -4	**3**	**3**	**2**	**2**	**2**	**2**	-	**2**	-	**1**	-	**2**	-	-
Average	**3**	**3**	**2.25**	**1.75**	**2.25**	**2**		**2**		**1**		**2.5**		

Syllabus:

Unit No.	Content	Max. Hrs.
1	**Regression:** Supervised and Unsupervised Learning, Regression, Model and Cost Function, Gradient Descent, Multivariate Linear Regression, Feature Scaling, Gradient Descent for multivariable	7

2	**Classification:** Classification, Hypothesis Representation, Decision Boundary, Cost function and Gradient Descent, Multi-classification, Regularization, Model Evaluation	6
3	**Supervised Learning:** KNN, SVM, Decision tree, Naive Bayes Classifiers, Random Forest	6
4	**Unsupervised learning:** K-means clustering, Hierarchical Clustering, DBSCAN Clustering, PCA, Anomaly Detection, Recommender System	6
5	**Artificial Neural Network:** Introduction to neural network, Activation Functions, Perceptron rule, Back propagation	6
6	**Deep Learning:** Introduction to deep learning, building blocks of CNN, Computational Complexity, Lenet, Alexnet, **New topics to be announced time to time**	7
	Total Lecture Hours	**38 Hours**

Text Books:

Text books:				
1	Understanding Machine Learning. https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/copy.html	2017	ShaiShalev-Shwartz and Shai Ben-David.	Cambridge University Press.
2	The Elements of Statistical Learning. https://web.stanford.edu/~hastie/ElemStatLearn/	2009	Trevor Hastie, Robert Tibshirani and Jerome Friedman.	Second Edition
3	Pattern Recognition and Machine Learning. https://www.microsoft.com/en-us/research/people/cmbishop/downloads/	2006	Christopher Bishop.	Springer

Reference books:				
1	Foundations of Data Science.	2017	Avrim Blum, John Hopcroft and RavindranKannan.	
2	Deep Learning, Part II, http://www.deeplearningbook.org/	2016	Goodfellow, I., Bengio, Y., Courville, A.	MIT Press
3	Machine Learning: A Probabilistic Perspective	2012	Kevin P. Murphy	MIT Press

Website / Data sheet:

SN	**Title**
1	
2	

VI Semester
IIOT2357: Lab.: Machine Learning for IIoT

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	**Apply** the knowledge of Mathematics and programming to build machine learning models
CO 2	**Analyze** different use cases to evaluate the performance of the models
CO 3	**Design and develop** application models using supervised and unsupervised learning algorithms
CO 4	**Compare** different machine learning techniques and **demonstrate the comprehension** of the trade-offs involved in design choices

Lab Experiment List:

Expt. No	Name of Experiment
	Apply Following Techniques on different use cases. Apply, analyse, develop and demonstrate different ML models and evaluate it using Python
1	Data Pre-processing and cleaning
2	Linear Regression
3	Non Linear Regression
4	K-Nearest Neighbours
5	Decision Tree
6	Support Vector Machine
7	K-Means Clustering
8	Hierarchical Clustering
9	Content based Recommendation System
10	Collaborative filtering Recommendation System

VI Semester
IIOT2358 : Design Tool Lab-2

Course Objective:

- To acquaint the students with real life problems and their solution by developing small projects

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Analyze the data acquisition systems
CO 2	Design and develop Wireless applications
CO 3	Develop projects on ARM processor
CO 4	Solve scientific problems using software programming

Experiment List

Expt No.	Name of Experiment
1	Mini project -01 (MSPA-1 Evaluation for 15 Marks) Analog discovery kit
2	Mini project -02 (MSPA-2 Evaluation for 15 Marks) ESP8266 applications
3	Mini project -03 (MSPA-3 Evaluation for 15 Marks) ARM based projects
4	Mini project -04 (MSPA-4 Evaluation for 15 Marks) Software programming for solving scientific problems

VI Semester

IIOT2359 : Cryptograpghy for IIoT

Course Objective:

- To Know mathematics behind Cryptography
- To understand attacks effect on Security
- To familiarize with different types Encryption –Decryption Techniques
- To impart knowledge on Network security

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Solve and relate mathematic concepts behind the cryptographic algorithms.
CO 2	Explain basic concepts and algorithms of cryptography
CO 3	Evaluate the role played by various security mechanisms like passwords
CO 4	Understand IP security

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	-	-	1	-	-	-	-	-	-	2	-	-
CO 2	2	2	2	2		-	-	-	1	2	-	-	-	-
CO 3	3	2	2	2	1	-	-	-	1	2	-	-	-	-
CO 4	2	2	1	-	1	-	-	-	-	1	-	-	-	-
CO 5														

Syllabus:

Unit	Content	Hours
1	Cryptography Mathematics: Integer Arithmatic, Modular Arithmatic, Euclidiean Algorithm, Modulo operator, Congruence,Primitiveroots,Inverses, Extended Eculidian Algorithm.	6
2	Introduction to Security:-Security Goals ,Cryptographic Attacks, Services and Mechanisms, Techniques.	6
3	Traditional Symmetric Key Ciphers:-Kerchoff's Principal, Substitution Ciphers (mono alphabetic ciphers, poly alphabetic ciphers)-Transposition Ciphers-Stream and Block Ciphers. Modern Symmetric Key Ciphers:- Substitution Box-Permutation Box.	6

4	Symmetric Key Block Cipher :Fiestel and Non-Fiestel Ciphers, Data Encryption Standard (Encryption , Decryption , Key Generation Algorithm), Advanced Encryption Standard (AES) (Encryption , Decryption , Key Generation Algorithm).	6
5	Public Key Cryptosystems : - Knapsack Cryptosystem ,RSA Cryptosystem , Rabin Cryptosystem (Encryption, Decryption ,Key Generation)	6
6	Network Layer Security : - IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload- Intruders, Internet Key Exchange Algorithm (Diffie-Hellman Key Exchange)	6
	Total Lecture Hours	**36 Hours**

Text Books:

SN	Title	Edition	Authors	Publisher
1	Cryptography and Network Security	Second Edition	Behrouz A. Forouzan	Mcgraw-Hill

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Cryptography and Network Security Principles and Practices .	4'th	William Stallings	(Pearson Edu Asia)

Website / Data sheet:

SN	Title
1	Nptel Video : https://www.youtube.com/watch?v=Q-HugPvA7GQ&list=PL71FE85723FD414D7
2	https://www.youtube.com/watch?v=LWU11bLvXKI&list=PLJ5C_6qdAvBFAuGoLC2wFGruY_E2gYtev&index=36

VI Semester
IIOT2361 : PE-II Digital Image processing

Course Objectives

- The objective of this course is to introduce the students to the concepts of Digital Image Processing so that it can be used in advanced studies and projects.

Course Outcomes
After completion of the course, student will demonstrate the ability to:

Course Outcome	Course Outcome Statement	Bloom's Taxonomy Level
CO 1	**Apply** the basic concepts of digital image processing and digital image geometry to interpret image data	L3
CO 2	**Apply**the image enhancement and restoration techniques in spatial and frequency domain to improve quality of image	L3
CO 3	**Analyze** digital Image usingedge detection and region merging/splitting/growing techniques for image segmentation	L4
CO 4	**Apply** different compression techniques to **estimate** image compression	L3
CO 5	**Conduct** experiments using MATLAB for processing the digital images	L3

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	1												
CO 2	2	2											2	
CO 3	2	3	2										2	
CO 4	2	3												
CO 5					3			2	2	2		2	2	

Syllabus :

Unit	Content	Hours
1	Introduction to image processing: Fundamental steps in digital image processing, Elements of visual perception, Image sensing and acquisition, Basic Concepts in Sampling and Quantization, representing digital images, representation of colour image.	7
2	Image Enhancement: Some basic gray level transformations, Histogram Processing, Histogram modification, Image subtraction, spatial filtering, Sharpening Spatial filters, use of first and second derivatives for enhancement; LoG, Image Enhancement in the Frequency Domain, Gaussian filters, homomorphic filtering, pseudo colouring: intensity slicing, Gray level to colour transformation	7

		June 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

3	Image Segmentation: Some Basic Relationships between pixels, point, line and edge detection, Gradient operators, Canny edge detection, Edge linking and boundary detection. Hough transform, Chain codes, boundary segments, skeletons, Boundary descriptors, Fourier descriptors	7
4	Threshold based Image Segmentation: The role of illumination, global thresholding, adaptivethresholding, use of boundary characteristics for histogram improvement and local thresholding, Region-based segmentation, region-based segmentation, region growing, region splitting and merging.	7
5	Image Restoration: Degradation model, Algebraic approach to restoration, Inverse filtering, Least mean square filters, Constrained Least Squares Restoration, Interactive Restoration	7
6	Imagecompression: Redundancies and their removal methods, Fidelity criteria, Image compression models, Source encoder and decoder, Error free compression, Lossy compression.	7
	Total Lecture Hours	**42 Hours**

Text Books:

SN	Title	Edition	Authors	Publisher
1	Digital Image processing	4th Edition	Rafael C. Gonzalez, Richard E Woods	Wesley/ Pearson Education
2	Fundamentals of Digital Image processing	2nd Edition	A.K.Jain	Prentice Hall od India

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Digital Image Processing	2nd Edition	William K. Pratt	John Wilely

Website / Data sheet:

SN	Title
1	Nptel Video :Dr. P.K. Biswas ,Video Lectures on NPTEL website https://nptel.ac.in/courses/117105079

VI Semester
IIOT2362 : PE-II: Lab.: Digital Image processing

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	**Apply** the basic concepts of digital image processing and digital image geometry to interpret image data
CO 2	**Apply**the image enhancement and restoration techniques in spatial and frequency domain to improve quality of image
CO 3	**Analyze** digital Image usingedge detection and region merging/splitting/growing techniques for image segmentation
CO 4	**Apply** different compression techniques to **estimate** image compression
CO 5	**Conduct** experiments using MATLAB for processing the digital images

Lab Experiment List:

Expt. No	Name of Experiment
1	Image Fundamentals 1. Read and display RGB Image , Observe three different image planes of RGB image 2. Convert RGB image to Grayscale Image 3. Determine negative of image using a) imcomplement function b) Using for loop logic c)Find difference of output for above two methods
2	Spatial Image Enhancement 1. Image Thresholding 2. Intensity Slicing (enhance perticular range of intencities) 3. Intensity modification using log and antilog
3	Image Transform 1. DFT : Verify the magnitude and phase interchanging effect of two images of same size 2. DCT: Reconstruction of image using fewer coeffients of DCT (Information in DCT is concentrated on left most corner)
4	Bit plane Slicing 1. Creation of 8 bit plane images and display the same. 2. Reconstruct image using B7+B6, B7+B6+B5, B7+B6+B5+B4 bit planes. 3. Reconstruct image using MSB bit planes and LSB bit planes
5	Histogram Equalization 1. Perform Image enhancement using imhist command from Matlab Perform Image enhancement using program developed for histogram equalisation
6	Spatial Filtering 1. Perform Spatial filtering on image having noise with Averaging Filter mask (3x3,5x5,9x9,25x25) b. Median Filter mask
7	Edge detection Edge detection using different directional Prewitt, Sobel operators
8	Transform domain Filtering 1. Perform Transform domain filtering on image having noise with a)Butterworth filter Low pass b) Gaussian Filter

		June 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

VI Semester
IIOT2363 : PE-II Flexible Manufacturing System

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Develop FMS using the most appropriate technique
CO 2	Implement FMS concept in a manufacturing environment
CO 3	Explain the role of automation in manufacturing
CO 4	Classify automation equipment and assembly systems into different categories

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	2	3	2	1					1	1	1	1
CO 2	3	3	2	2	2	1						1	1	1
CO 3	3	3	3	2	1						1		1	1
CO 4	3	3	3	2	2	1							1	1

Syllabus:

Unit	Content	Hours
1	FMS concept, Components of FMS, FMS Layouts, FMS planning and implementation. Tool Management systems-Tool monitoring, Work holding devices Modular fixturing, flexible fixturing, flexibility, quantitative analysis of flexibility, application and benefits of FMS	7
2	Automated material handling system, AGVs, Guidance methods, AS/RS	8
3	Group Technology, Part families, Part classification and coding, Production flow analysis, Machine cell design, Applications and Benefits of Group Technology	8
4	Structure of a Process Planning, Process Planning function, CAPP - Methods of CAPP, CAD based Process Planning, Retrieval process planning, Generative Process Planning with expert system, Inventory management: Materials requirements planning - basics of JIT	7
5	Monitoring and quality control: Types of production monitoring system, process control & strategies, direct digital control - Supervisory computer control – computer aided quality control - objectives of CAQC, QC and CIM, contact, non-contact inspection methods, CMM and Flexible, Inspection systems, Integration of CAQC with CIM.	7
6	Integrated approach of FMS system, FMS for Automotive sector, FMS integration for IoT, simulation software for FMS system integration	7
	Total Lecture Hours	**42 Hours**

Text Books:

SN	Title	Edition	Authors	Publisher
1	Computer aided Design and Manufacturing	1987	Groover M.P.,	Prentice Hall of India
2	Computer control of manufacturing system	1986	YoremKoren	McGraw Hill,
3	CAD/CAM/CIM	2000	Radhakrishnan. P, Subramanyam. S	New Age International Publishers,

Reference Books:

SN	Title	Edition	Authors	Publisher
1	"Principles of Computer Integrating Manufacturing"	1999	Kant Vajpayee. S.	Prentice Hall of India
2	"CIM – Towards the factory of the Future"	1994	Scheer. A.W.	Springer-Verlag

Links for E books in YCCE LIBRARY

SN	Link
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

Links for online courses including SWAYAM / NPTEL/ COURSERA/ UDEMY

SN	Link
1	https://nptel.ac.in/courses/112102103
2	https://nptel.ac.in/courses/112105249
3	https://nptel.ac.in/courses/112105211

VI Semester
IIOT2364 : PE-II: Lab: : Flexible Manufacturing System

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Develop FMS using the most appropriate technique
CO 2	Implement FMS concept in a manufacturing environment
CO 3	Explain the role of automation in manufacturing
CO 4	Classify automation equipment and assembly systems into different categories

Lab Experiment List:

Expt. No	Name of Experiment
1	Creation and simulation of palletizing operation
2	Creation and simulation of Pick and Place (XYZ) operation
3	Creation and simulation of production operation involving simultaneous control of machining centers
4	Creation and simulation of part separation operation on multiple conveyors
5	Creation and simulation of part separation operation on multiple conveyors
6	Creation and simulation of sorting operation based on part height and weight on multiple conveyors using a sorting station equipped with vision sensor
7	Creation and simulation of AGV path planning
8	Creation and simulation of Arc and Spot-Welding cell
9	To write and execute a robot program to perform a repetitive pick & place operation
10	To write and execute a robot program to perform a palletizing operation
11	To write and execute a robot program to perform a packaging operation
12	To write and execute a robot program to perform an assembly operation

VI Semester
IIOT2365 : PE-II Digital Signal Processing

Course Objective:

This course will provide

- Classification of discrete time signals and system.
- Properties and Applications of Discrete Fourier Transform
- Design of Filter Structures and Different Filtering Techniques (FIR/IIR) in DSP
- Introduction to Multi- rate Signal Processing

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	**Apply the** concepts of trigonometry, complex algebra, Fourier transform, z-transform and concepts of signals and system to analyze DSP problems and demonstrate it using software tool
CO 2	**Acquire knowledge, Apply and analyze** the operations on Digital signals Systems and demonstrate it using software tool
CO 3	**Design, implement, analyze and demonstrate digital** filters for processing of discrete time signals in basic and advance form like multi-rate filters
CO 4	**Design and demonstrate** fundamental knowledge of Digital signal processing using modern Engineering tool. Also develop creative and innovative designs that achieve desired performance criteria within specified objectives and constraints, understand the need for lifelong learning and continuing professional education

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	3	3	2	2	3	3	-	-	-	-	2	1	-	-
CO -2	3	3	3	3	3	3	-	-	-	-	1	1	-	-
CO -3	3	3	2	2	2	3	-	-	-	-	1	1	-	-
CO -4	3	3	3	3	3	3	-	-	-	-	1	1	-	-

Syllabus:

Unit	Content	Hours
1	Discrete Time (DT) Signals and System, Classification of DT signals, classification of DT systems, linear Convolution, Sampling and reconstruction.	
2	Discrete Time Fourier Transform, Discrete Fourier Transform, Computation of DFT, Properties of DFT, convolution of data sequences, FFT algorithms, Decimation in time, Decimation in Frequency	
3	Digital Filter structures: FIR digital filter structures, IIR digital filter structures, Lattice structures, Finite word length effect	

4	IIR Digital filter Design, Bilinear transformation, Impulse invariant transformation, Low pass IIR digital filters, Butterworth and Chebyshev filter	
5	FIR Digital Filter Design, FIR filter design using windowing techniques	
6	Multi-rate Digital Signal processing fundamentals, sampling rate alteration, multi-rate structures, Decimator and Interpolator and Multistage design.	
	Total Lecture Hours	**00 Hours**

Text Books:

SN	Title	Edition	Authors	Publisher
1.	Digital Signal Processing – Principles, Algorithms and Applications	3rd Edition ,1996	J. G. Proakis, D. G. Manolakis	PHI
2.	Digital Signal Processing- A Computer Based Approach	4th Edition, 2013	SanjitMitra	TMH

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Discrete Time Signal Processing	2nd edition, 1999	V. Oppenheim, R, W, Schafer	PHI

Website / Data sheet:

SN	Title
1	
2	
3	

VI Semester
IIOT2366 : PE-II : Lab: Digital Signal Processing

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	**Apply the** concepts of trigonometry, complex algebra, Fourier transform, z-transform and concepts of signals and system to analyze DSP problems and demonstrate it using software tool
CO 2	**Acquire knowledge, Apply and analyze** the operations on Digital signals Systems and demonstrate it using software tool
CO 3	**Design, implement, analyze and demonstrate digital** filters for processing of discrete time signals in basic and advance form like multi-rate filters
CO 4	**Design and demonstrate** fundamental knowledge of Digital signal processing using modern Engineering tool. Also develop creative and innovative designs that achieve desired performance criteria within specified objectives and constraints, understand the need for lifelong learning and continuing professional education

Lab Experiment List:

Expt. No	Name of Experiment
1	Generation of CT signal and discrete time signal & to verify sampling effect.
2	Generation of Discrete Time Signal
3	Operations on Discrete Time Signals
4	Convolution
5	To find the DFT and IDFT of the signals
6	FIR Filter Design
7	IIR Filter Design
8	Upsampling and Downsampling

VI Semester
(Audit Course)
AU2130 : YCCE Communication Aptitude Preparation (YCAP6.3)

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2021

7th & 8th Semester

(Department of Electronics Engineering

Industrial Internet of Things (IIoT)

28 June 2019

VII Semester
IIOT2401: Cloud Computing

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	**Apply** the knowledge of top-down view of cloud computing, from applications and administration to programming and infrastructure.
CO 2	**Analyze** different topic introduces students with various concepts like cloud systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems
CO 3	**Design and develop** different topic introduces students with various concepts like cloud systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems
CO 4	**Compare** different state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft etc

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	3	3	1	1	1	-	-	-	-	-	-	3	-	-
CO -2	3	3	3	2	3	-	-	-	-	-	-	3	-	-
CO -3	**3**	**3**	**3**	**2**	**3**	**2**	**-**	**2**	**-**	**1**	**-**	**2**	**-**	**-**
CO -4	**3**	**3**	**2**	**2**	**2**	**2**	**-**	**2**	**-**	**1**	**-**	**2**	**-**	**-**
Average	**3**	**3**	**2.25**	**1.75**	**2.25**	**2**		**2**		**1**		**2.5**		

Syllabus:

Unit .	Content	Max. Hrs.
1	**Introduction to Cloud Computing:** What is a cloud, Definition of Cloud Computing, Characteristics of Cloud Computing, Driving factors towards cloud,Architecture, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services	7

		June 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

2	**Cloud Models:** Service Models: IaaS, PaaS, SaaS, NaaS, Cloud Clients, Deployment Models: Public Clouds, Community Clouds, Hybrid Cloud, Private Cloud, Issues in Cloud Computing, Applications.	6
3	**Infrastructure as a Service(IaaS):** IaaS definition, Introduction to virtualization, Different approaches to virtualization, Resource Virtualization- Server, Storage, Network, Hypervisors, Machine Image, Virtual Machine(VM), Data storage in cloud computing(storage as a service), Examples like Amazon EC2-Renting, EC2 Compute Unit, Platform and Storage, pricing, customers.	7
4	**Platform as a Service(PaaS):** What is PaaS, Service Oriented Architecture (SOA), Cloud Platform and Management, Examples like Google App Engine.	6
5	**Software as a Service(SaaS):** Introduction to SaaS, Web services, Web 2.0	6
6	Overview of Security Issues, Infrastructure Security: Network level security, Host level security, Application level security, Data security and Storage, Challenges and Risks of Cloud Computing Platforms and Cloud Services	6

Text Books:

Text books:				
1	Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, Cloud Computing: Principles and paradigms, 2011			

Reference books:				
1	Miller, Cloud Computing, 2008			

VII Semester
IIOT2402: Lab. Cloud Computing

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Configure various virtualization tools such as Virtual Box, VMware workstation.
CO 2	Design and deploy a web application in a PaaS environment.
CO 3	Learn how to simulate a cloud environment to implement new schedulers.
CO 4	Install and use a generic cloud environment that can be used as a private cloud
CO5	Manipulate large data sets in a parallel environment.

Lab Experiment List:

Expt. No	of Experiment
1	Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3	Install Google App Engine. Create hello world app and other simple web applications using python/java.
4	Use GAE launcher to launch the web applications.
5	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6	Find a procedure to transfer the files from one virtual machine to another virtual machine.
7	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8	Install Hadoop single node cluster and run simple applications like wordcount.

VII Semester
IIOT2403: Internet of Things Applications

Course Objective:

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules.
3. Market forecast for IoT devices with a focus on sensors.
4. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Ability to **understand**, define and explain the fundamental concepts of Internet of things and wireless sensor networks.
CO 2	Ability to **apply** the knowledge of communication, networks and coding to networks.
CO 3	Ability to **analyze** the given network parameters and arrive at suitable conclusions**.**
CO 4	**Create** IoT applications using Raspberry Pi board using Python interfacing various sensors.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	2	1	-				-	2	1	-	-	1		
CO -2	3	1	1				-	1	1	-	-	1		
CO -3	1	-	3				-	1	1	-	-	1		
CO -4	2	-	3		3			2	1	-	-	1		

Syllabus:

Unit	Content	Hours
1	**IoT Networking Core** Technologies involved in IoT development, Internet web and Networking technologies, Infrastructure, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards, Wireless networking equipment and configurations, accessing hardware and device file interactions.	7
2	**M2M to IoT** – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations	8
3	**IoT Architecture -State of the Art** – Introduction, State of the art, Architecture Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant	7

	architectural views.	
4	**IoT Application Development** Application protocols: MQTT, REST/HTTP, CoAP, MySQL, Back-end Application Designing Apache for handling HTTP Requests, MongoDB Object type Database, HTML, CSS & jQuery for UI Designing, JSON lib for data processing, Security & Privacy during development	8
5	**IoT Security and case studies** Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities.	7
6	**Industrial IoT**- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management, case studies	7

Text Books:

SN	Title	Edition	Authors	Publisher
1	Internet of Things (A Hands-on-Approach)	1 st Edition, VPT, 2014	Vijay Madisetti and Arshdeep Bahga	-
2	Rethinking the Internet of Things: A Scalable Approach to Connecting Everything	1 st Edition, Apress Publications, 2013	Francis daCosta	-
3	Designing the Internet of Things	November 2013, John Wiley and Sons.	Adrian McEwen, Hakim Cassimally	

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Learning Internet of Things	2015	Peter Waher	Packt Publishing
2	Internet of Things –From Research and Innovation to Market		OvidiuVermesan Peter Friess	
3	Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems		Dr. OvidiuVermesan, Dr. Peter Friess	River Publishers

Website / Data sheet:

SN	
1	https://mrcet.com/downloads/digital_notes/EEE/IoT%20&%20Applications%20Digital%20Notes.pdf
2	https://onlinecourses.swayam2.ac.in/arp19_ap52/preview
3	https://www.educba.com/applications-of-iot/
4	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electronics%20Engineering/64.Hands-On-ESP8266-Mastering-Basic-Peripherals@IoT_reference.pdf
5	https://onlinecourses.nptel.ac.in/noc22_cs95/preview

VII Semester
IIOT2404: Lab. Internet of Things Applications

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Identify the components that forms part of iot architecture.
CO 2	Determine the most appropriate iot devices and sensors based on case studies.
CO 3	Setup the connections between the devices and sensors.
CO 4	Evaluate the appropriate protocol for communication between iot.
CO 5	Analyse the communication protocols for iot.

Lab Experiment List:

Expt. No	Name of Experiment
1	Interfacing Light Emitting Diode(LED)- Blinking LED
2	Interfacing Light Dependent Resistor (LDR) and LED, displaying automatic night lamp
3	Sketch the architecture of IoT Toolkit and explain each entity in brief
4	Interfacing Temperature Sensor(LM35) and/or humidity sensor (e.g. DHT11) This use case will help to connect traditional environmental monitoring sensors
5	Interfacing Liquid Crystal Display(LCD) – display data generated by sensor on LCD This case study will demonstrate how to provide local display unit with Arduino micro controller. Use suitable libraries for implementing these case studies..
6	To Interfaced Sensor (DHT) and Communication Module (LoRa) with Processor (Node MCU) .
7	Interfacing Air Quality Sensor-pollution (e.g. MQ135) - display data on LCD.
8	Interfacing Relay module to demonstrate Bluetooth based home automation application. (Using Bluetooth and relay).
9	Interfacing Bluetooth module (e.g. HC05)- receiving data from mobile phone on Arduino and display on LCD
10	Case Study -I

VII Semester
IIOT2411: PE III : Power Electronics and Drives

Course Objectives:

- To learn different power semiconductor devices.
- To understand different converter topologies, their operation and applications
- To understand various advanced control schemes of AC, DC Drives.

Course Outcomes:

At the end of the program the student will be able to:

CO1	**Choose** and **classify** power semiconductor devices for different applications	L2
CO2	**Illustrate**, **develop** and **analyse** phase-controlled converters and DC-DC Converter circuit	L4
CO3	**Identify** and **compare** the performance of inverter circuits	L4
CO4	**Apply** the dc/ac and special motor drives to IOT applications and **analyse** their performance	L4

CO PO mapping table

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3			1								`2	1	
CO2	3	2	1	2								2	3	
CO3	3	2	2	2								2	3	
CO4	3	2	2	2								2	3	

Course Contents:

Unit 1: Power semiconductor devices

SCR and its characteristics, SCR turn-ON, turn-OFF.

Basic introduction of MOSFET, GTO, IGBT devices(structure, operation and characteristics)

Unit 2: AC to DC converters

Single phase single pulse converter, Bridge converter. Effect of freewheeling diode

Three phase three pulse, six pulse converter, single phase half-controlled converter

Unit 3: DC to DC Converter

Buck, Boost, Buck-Boost Converter with control strategies.

Continuous conduction mode, Discontinuous conduction mode Analysis and Design

Unit 4: DC to AC Converter

Single phase and three phase bridge inverters, Output voltage control, Harmonics in output voltage waveforms, Harmonic reduction by pulse width modulation techniques, current source inverters.

Unit 5: Conventional Motor Drives:

Characteristics, Starting Methods, Braking Methods of DC Motor & Induction Machines, Speed Control of DC Motor Using Converters and Choppers. Speed Control of squirrel Cage Rotor using AC voltage controllers, Voltage-Source and Current-Source Inverters. V/f Control.

Unit 6: Special Machines & IOT Applications in control of drives

Permanent Magnet Brush-Less Motor Drives, Permanent Magnet Synchronous Motor Drives, and Stepper and Reluctance Motor Drives. IOT based speed control of electrical motors, IOT Usage in the Electrical Power Industry, IOT SCADA.

TEXTBOOK:

SN	Author Name	Title	Publication
1.	M. H. Rashid	Power Electronics Circuit's Devices and Applications	3rd Edition,2004 Prentice Hall Limited
2	Devdutta Shingare	Power Electronics	ElectroTech publishers
3.	G. K. Dubey	Fundamentals of Electric drives	Narosa Publications,2nd Edition
4.	V. Subramaniam	Electric drives concepts and applications	Tata McGraw Hill, 2005
5.	R. Krishnan	Electric Motor Drives	Prentice Hall India, 2001

REFERENCE BOOKS:

SN	Author Name	Title	Publication
1.	C. W. Lander	Power Electronics	McGraw Hill publication, 1981
2.	Dr. M. Ramamoorty	Thyristors and their Applications	2nd Edition, East West press, 2002
3.	Dr.G. K. Dubey, Doralda Sinhaand Joshi	Thyristor and their Applications	New Age International
4.	Theodore Wildi	Electrical Machines Drives and Power Systems	Pearson Education, 6th edition 2008

Links:

S.N.	Name	Links / Website
1	Power Electronics Circuit's Devices and Applications	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20Electronics/
2	Industrial Drives - Power Electronics, IISc Bangalore	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20Electronics/

VII Semester
IIOT2412: PE III : Wireless Sensor Network

Course Objective:

- To learn different protocols adopted in wireless sensor networks.
- To understand sensor network architecture.
- To explore networking in wireless sensor networks.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	**Understand** the WSN node Architecture and Network Architecture and explain the basic concepts of wireless sensor networks
CO 2	**Describe and explain** communication protocols adopted in wireless sensor networks
CO 3	**Identify** the Wireless Sensor Network Platforms
CO 4	**Describe and explain** the hardware, software, and communication for wireless sensor network nodes

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	-	1		
CO 2	2	2	-	-	-	-	-	-	1	-	-	1		
CO 3	2	2	1	-	-	-	-	-	-	-	-	1		
CO 4	-	3	2	-	-	-	-	-	-	-	-	-		
CO 5	2	1	-	-	-	-	-	-	-	-	-	1		

Syllabus:

Unit	Content	Hours
1	Introduction & architecture: Motivation of Wireless Sensor Nodes, Challenges, constraints for WSN, applications, single node architecture, Hardware components, Energy consumption of sensor nodes, Operating systems, and execution environments.	6
2	Network architecture: Sensor network scenarios, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.	6
3	Communication protocols: Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wake Up Concepts - S-MAC, Contention based Protocols, Schedule based protocols.	6
4	Link layer Protocols: Fundamental, Error Control, Framing, Link Management, Naming And	6

	Addressing – Fundamentals, Assignment of MAC Address, Distributed assignment of locally unique addresses, Content based and geographic addressing	
5	Naming and addressing, Time synchronization: Properties of Localization and positioning procedures, single hop localization, positioning in multihop environments, and impact of anchor placement. Clustering.	6
6	Data centric and content-based networking: Data centric routing, Data aggregation, Data centric storage, Topology control-controlling topology in a flat network, Hierarchical network by dominating set, Hierarchical network by clustering, transport layer and Quality of service.	6

Text Books:

SN	Title	Edition	Authors	Publisher
1	Protocols and Architectures for Wireless Sensor Networks.	2nd Edition	H. Karl and A. Willig.	John Wiley & Sons, June 2005.
2	Wireless Sensor Networks: Technology, Protocols, and Applications	2nd Edition	K. Sohraby, D. Minoli, and T. Znati.	John Wiley & Sons, March 2007.
3	Protocols and Architectures for Wireless Sensor Networks.	2nd Edition	H. Karl and A. Willig.	John Wiley & Sons, June 2005.

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Fundamentals of wireless sensor networks: Theory and Practice.,	2nd Edition	Waltenegus Dargie,Christian Poellabauer,	Wiley & sons, 2010

Website / Data sheet:

SN	Title
1	https://cse.iitkgp.ac.in/~smisra/course/wasn.html
2	http://103.152.199.179/YCCE/yccelibrary.html
3	• https://nptel.ac.in/courses/106/105/106105160/ • https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/

VII Semester
IIOT2413: PE III : Additive Manufacturing

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Apply the knowledge of additive manufacturing for creation of prototypes
CO 2	Conduct evaluation of different additive manufacturing process parameters
CO 3	Design solutions for effective optimization of 3-D printing processes
CO 4	Analyze effectiveness of 3-D printing process over traditional methods for product in hand using mathematical models

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	3	3	2	3	2	1					1		1	1
CO	3	3	2	3	2		1						1	1
CO	3	2	3	2	1	1						1	1	1
CO	3	3	2	3	2	1	1				1		1	1

Syllabus:

Unit	Content	Hours
1	**Introduction to Additive Manufacturing (AM)** General overview Introduction to reverse engineering Traditional manufacturing vs AM, Computer aided design (CAD) and manufacturing (CAM) and AM Different AM processes and relevant process physics AM process chain Application level: Direct processes – Rapid Prototyping, Rapid Tooling, Rapid Manufacturing; Indirect Processes - Indirect Prototyping, Indirect Tooling, Indirect Manufacturing	7
2	**Materials science for AM** Discussion on different materials used Use of multiple materials, multifunctional and graded materials in AM Role of solidification rate Evolution of non-equilibrium structure property relationship Grain structure and microstructure.	7
3	**AM Technologies** Powder-based AM processes involving sintering and melting (selective laser sintering, shaping, and electron beam melting. involvement). Printing processes (droplet based 3D Solid-based AM processes - extrusion based fused deposition modeling object Stereo lithography Micro- and Nano-additive.	8

4	**Mathematical Model for AM** Transport phenomena models: temperature, fluid flow and composition, buoyancy driven tension driven free surface flow pool) Case studies: Numerical Modeling of AM process, Powder bed melting based process, Droplet based printing process Residual stress, part fabrication time, cost, optimal orientation and optimal Defect in AM and role of transport Simulations (choice of parameter, Mo de! validation for different)	7
5	**Process selection, planning, control for AM** Selection of AM technologies using decision methods, Additive manufacturing process plan: strategies and post processing. Monitoring and control of defects, transformation	8
6	**Introduction to Reverse Engineering** Meaning, Use, RE-The generic process, Phase of RE–scanning, Contact Scanners, Noncontact Scanners, Point Processing, Application Geometric Model, Development.	7

Text Books:

SN	Title	Edition	Authors	Publisher
1	Additive Manufacturing Technologies	2009	Ian Gibson, David W. Rosen, Brent Stucker	Springer
2	Rapid Prototyping: Principles and Applications	Second Edition (2003)	Chua C. K., Leong K. F., and Lim C. S	World Scientific Publishers
3	Rapid Prototyping: Laser-Based and Other Technologies	2004	Patri K. Venuvinod, Weiyin Ma	Springer

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Peter D. Hilton, Hilton/Jacobs, Paul F. Jacobs, "Rapid Tooling: Technologies and Industrial Applications", CRC Press,2000.			
2	Automated fabrication	1993	Burns. M,	Prentice-Hall,.

Links for E books in YCCE LIBRARY

SN	Link
1	https://ebooks.wileyindia.com/explore;searchText=ADDITIVE%20MANUFACTURING;mainSearch=1;themeName=Default-Theme/product-details/284055
2	https://link.springer.com/search?facet-content-type=Book&query=ADDITIVE

		June 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Links for online courses including SWAYAM / NPTEL/ COURSERA/ UDEMY

SN	Link
1	https://onlinecourses.nptel.ac.in/noc21_me115/preview
2	https://onlinecourses.nptel.ac.in/noc22_me130/preview
3	https://onlinecourses.nptel.ac.in/noc20_mg70/preview

VII Semester
IIOT2421 : PE IV:Industrial Automation

Course outcomes

1. Explain architecture of industrial automation system.
2. Illustrate the process control, PLC architecture and interfacing
3. Develop PLC ladder logic for industrial applications
4. Demonstrate the function of SCADA with PLC systems.

Course Matrix (CO PO Mapping Table)

Leve	CO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO
5	CO	**3**	**3**	**3**	**3**				**2**				**3**		**2**
2	CO	**3**	**3**	**3**	**3**				**2**				**3**		**2**
3	CO	**3**	**3**	**3**	**3**				**2**				**3**		**2**
2	CO	**3**	**3**	**3**	**3**				**2**				**3**		**2**

Unit 1: Introduction

Automation overview, requirement of automation, systems, architecture of industrial automation system, introduction of PLC and supervisory control and data acquisition (SCADA). Industrial bus systems: Modbus & profibus

Unit 2: Controllers & actuators

PID controller, mechanical switches, solid-state switches, electrical actuators: Solenoids, relays and contactors, ac motor, energy conservation schemes through vfd, dc motors, servo motor, pneumatic and hydraulic actuators.

Unit 3: PLC operation

Definition, advantages and importance of PLC, history of PLC, architecture and block diagram, types of PLC, CPU unit architecture, memory classification.

Unit 4: PLC programming

Basic ladder logic function, electrical wiring diagram, scan cycle, programming language of PLC, module addressing, basic relay, input, output and timer counter instruction, arithmetic and comparison function,

Unit 5: SCADA & distributed control system:

Introduction, block diagram, elements of SCADA, features of SCADA, MTU, RTU functions, applications of SCADA, communications in SCADA, introduction to DCS, architecture, input and output modules, specifications of DCS.

Unit 6: Material handling, automated storage system, and Identification Technologies

The material handling function, its types, analysis for Material handling systems, Storage system performance, automated storage/retrieval systems, work-in-process storage, interfacing handling and storage with manufacturing. Product identification system: Barcode, RFID etc.

TEXT BOOKS:

S.N.	Name	Year	Publication	Author
1	Programmable Logic controllers and Industrial Automation	2017	Penram International Publishing India Pvt. Ltd	Madhuchhanda Mitra, SamarjitSen Gupta

REFERENCE BOOKS:

S.N.	Name	Year	Publication	Author
1	Programmable Logic Controllers, Principles and Applications	2002	Prentice Hall of India Pvt. Ltd,5th Edition	John W. Webb, Ronold A
2	Industrial Instrumentation and Control	2007	S.K. Singh	The McGraw Hill Companies

Links:

S.N.	Name	Links / Website
1	Programmable Logic controllers and Industrial Automation	https://www.pdfdrive.com/programmable-logic-controllers-fifth-edition-e39695193.html
2	Programmable Logic Controllers, Principles and Applications	https://pdfcoffee.com/programmable-logic-controllers-principles-and-applications-pdf-free.html
3	Industrial Instrumentation and Control	https://www.pdfdrive.com/industrial-instrumentation-sk-singh-e48527877.html
4	Industrial Automation and Control, IIT Kharagpur	https://nptel.ac.in/courses/108105063

VII Semester
IIOT2422 : PE IV: Lab. : Industrial Automation

Course outcomes

1. Explain architecture of industrial automation system.
2. Illustrate the process control, PLC architecture and interfacing
3. Develop PLC ladder logic for industrial applications
4. Demonstrate the function of PLC with suitable application.

Course Matrix (CO PO Mapping Table)

Level	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
5	CO1	3	3	3	3				2				3		2
2	CO2	3	3	3	3				2				3		2
3	CO3	3	3	3	3				2				3		2
2	CO4	3	3	3	3				2				3		2

List of Practicals

1. Identify various parts and front panel status indicators of the given PLC.
2. Use PLC to test the START STOP logic for two input and one output.
3. Develop / Execute a ladder program for the given application using - timer, counter, comparison, logical, arithmetic instruction.
4. Measure temperature of the given liquid using RTD or Thermocouple and PLC.
5. Develop a ladder program to ON / OFF LED lamp.
6. Develop a ladder program for sequential control application of lamp or DC motor.
7. Develop a ladder program for traffic light control system.
8. Develop a ladder program for automated car parking system.
9. Develop a ladder program for rotating stepper motor in forward and reverse direction at constant speed.
10. Develop a ladder program for automated elevator control.

Links:

S.N.	Name	Links / Website
1	Industrial Automation Virtual Lab	https://ial-coep.vlabs.ac.in/

VII Semester
IIOT2423 : PE IV: Design for Manufacturing and Assembly

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Apply knowledge of IOT for design of prototypes
CO 2	Design smart prototypes using IOT system design methodology
CO 3	Conduct analysis of smart manufacturing techniques
CO 4	Analyze the process for smart design and fabrication

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	2	3	1	1						1	1	1
CO 2	3	3	2	3	2		1						1	1
CO 3	3	2	3	2	1	1						1	1	1
CO 4	3	3	2	3		1						1	1	1

Syllabus:

Unit	Content	Hours
1	**Introduction** **The Internet of Things:** An overview; Design Principles for Connected Devices; Internet Principles. **Thinking about Prototyping** – Costs versus ease of prototyping, prototyping and Production, open source versus Closed Source.	7
2	**IOT system design** Purpose and Requirement Specification• Process Specification• Domain model specification• Information Model Specification• Service specifications• IoT Level Specifications• Functional view specification• Operational View Specification• Device and Component integration• Application development	7
3	**Introduction to Smart Manufacturing** What is "smart manufacturing" really and how does it differ from conventional/legacy manufacturing-Smart Manufacturing Processes- Three Dimensions: (1) Demand Driven and Integrated Supply Chains;(2) Dynamically Optimized Manufacturing Enterprises (plant + enterprise operations);(3) Real Time, Sustainable Resource Management (intelligent energy demand management, production energy optimization and reduction of GHG)	8
4	**Smart Design/Fabrication** Smart Design/Fabrication - Digital Tools, Product Representation and Exchange Technologies and Standards, Agile (Additive) Manufacturing Systems and Standards. Mass Customization, Smart Machine Tools, Robotics and Automation (perception, manipulation, mobility, autonomy), Smart Perception – Sensor networks and Devices.	8

5	**Smart Applications** Online Predictive Modeling, Monitoring and Intelligent Control of Machining/Manufacturing and Logistics/Supply Chain Processes; Smart Energy Management of manufacturing processes and facilities	8
6	**Smart and Empowered Workers** Eliminating Errors and Omissions, Deskilling Operations, Improving Speed/Agility, Improving Information Capture/Traceability, Improving Intelligent Decision Making under uncertainty Assisted/Augmented Production, Assisted/Augmented Assembly, Assisted/Augmented Quality, Assisted/Augmented Maintenance, Assisted/Augmented Warehouse Operations and Assisted Training	7

Text Books:

SN	Title	Edition	Authors	Publisher
1	Smart Things: Ubiquitous Computing User Experience Design,	1st edition,	M. Kuniavsky	Morgan Kaufmann, 2010, ISBN-10: 0123748992.
2	Product Design and Manufacturing	4th edition, 2007	A. K. Chitale and R. C. Gupta	PHI Pvt. Ltd., 2002 ,
3	Designing the Internet of Things,	1st edition,	A. McEwen and H. Cassimally,	Wiley, 2013, ISBN-10: 111843062X.

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Product Design and Development	2003	Ulirich Karl T. and Eppinger Steven D	McGraw Hill Pub. Company
2	Handbook of Product Design for Manufacturing	1986	Bralla, James G.	McGraw Hill Pub. Company
3	Creativity and innovation	2008	Harry Nystrom	John Wiley & Sons, 1979.

Links for E books in YCCE LIBRARY

SN	Link
1	https://link.springer.com/search?query=DFMA&facet-content-type=Book
2	https://ebooks.wileyindia.com/explore;searchText=DESIGN%20FOR%20MANUFACTURING;mainSearch=1;themeName=Default-Theme
3	

Links for online courses including SWAYAM / NPTEL/ COURSERA/ UDEMY

SN	Link
1	https://nptel.ac.in/courses/107103012
2	https://onlinecourses.nptel.ac.in/noc19_me48/preview
3	https://nptel.ac.in/courses/112101005
4	https://ocw.mit.edu/courses/2-008-design-and-manufacturing-ii-spring-2003/

VII Semester

IIOT2424 : PE IV: Lab.: Design for Manufacturing and Assembly

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Apply knowledge of IOT for design of prototypes
CO 2	Design smart prototypes using IOT system design methodology
CO 3	Conduct analysis of smart manufacturing techniques
CO 4	Analyze the process for smart design and fabrication

Lab Experiment List:

Expt. No	Name of Experiment
1	DFA analysis for simple assembly
2	DFM analysis for cost estimation
3	Solid and Assembly model for DFM
4	Development of design guidelines
5	Tolerance optimization
6	DFA for inspection
7	DFA for packaging
8	Machining process optimization
9	Design for supply chain
10	Closing loop for final production review
11	Optimization of assembly against the cost
12	DFMA analysis and assessment

*Using DFMA virtual lab by Boothroyd and Dewhurst

VII Semester
IIOT2425 : PE IV: Wireless Communication for IIoT (5 G)

Course Objective:

1. To introduce the concepts and techniques associated with wireless cellular communication systems.
2. To provide a comprehensive overview and advanced knowledge of modern mobile and wireless communication systems.
3. To familiarize with state of art standards used in wireless cellular systems.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO	Statement	Bloom's Taxonomy Level
CO1	**Understand** basic concepts of wireless communication system	L2
CO2	**Apply** the knowledge of Cellular concepts on wireless medium.	L3
CO3	**Analyze** wireless communication using mathematical analysis.	L4
CO4	**Describe** the importance of various wireless networking standards along with applications and standard formats used for transmission	L2

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	3	3		2								1		
CO -2	3	3		3								1		
CO -3	3	2		2								2		
CO -4	3	3										2		

Syllabus:

Unit No.	Content	Max. Hrs.
1	The Cellular Concept: Evolution of Mobile Radio Communications, Comparison of common wireless communication systems, Examples of wireless communication system, Generations of cellular Networks, Cellular telephone system, frequency reuse, channel assignment and handoff strategies, interference and system capacity, Trunking & grade of service, improving capacity in cellular system	**7**

2	Mobile Radio Propagation-large scale path loss : Introduction to Radio Wave Propagation, free space propagation model, Reflection, Diffraction, Scattering, Signal Penetration into Buildings, Ray Tracing & Site Specific Modeling	**6**
3	Small Scale fading & Multipath: Multipath Propagation, Small Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types Of Small Scale Fading, Rayleigh & Rician Distribution	**6**
4	Equalization & Diversity: Fundamentals of equalization, space polarization, frequency and time diversity techniques, space diversity, polarization diversity, frequency and time diversity. RAKE Receiver	**7**
5	Wireless Systems and Standards: GSM- global system for mobile: services and features, GSM system architecture, GSM radio subsystem, GSM channel types, GSM frame structure, signal processing in GSM, introduction to CDMA digital cellular standard (IS-95).	**7**
6	Wireless Networking: Introduction to wireless networks, Differences Between Wireless & Fixed Telephone Networks, Development of wireless networks, Traffic routing in wireless networks, Basics of 5G technology, Performance parameters of 5G communication.	**6**

Text Books

SN	Title	Edition	Authors	Publisher
1.	Wireless Communication Principles and practice	2nd edition 2002	T S. Rappaport	Pearson
2.	Mobile Communications Design fundamentals	2nd edition 1997	William C. Y. Lee	John Willey

Reference Books

SN	Title	Edition	Authors	Publisher
1.	Wireless digital communication : modulation & spread spectrum applications	1st Edition	Kamilo Fehe	Prentice Hall
2.	Wireless and Cellular Communication	3rd Edition	W .C .Y. Lee	McGraw Hill
3.	The Mobile Radio Propagation channel	2nd Edition	J.D. Parson	Jon Wiley

4. **YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]**:
http://103.152.199.179/YCCE/yccelibrary.html

5. **MOOCs Links and additional reading, learning, video material:**
   1) **https://onlinecourses.nptel.ac.in/noc21_ee66**
   2) **https://nptel.ac.in/courses/117104099**

VII Semester
IIOT2426 : PE IV: Lab. Wireless Communication for IIoT (5 G)

Course Outcome: After completion of the laboratory work, student will demonstrate the ability to

CO 1	Understand different wireless communication parameters
CO2	Design & Simulate wireless channel with appropriate technique
CO 3	Analyze and implement received power using different propagation models
CO 4	Use of modern tools to simulate & Evaluate various wireless communication parameters.

Lab Experiment List:

Expt. No	of Experiment
1	Understand different parameters frequency reuse factor and signal to interference ratio for the given path loss exponent
2	Estimate data and voice traffic analysis in lost call system
3	Analyze and simulate received power for free space propagation model
4	Implement large scale path loss using Hata propagation model
5	Analyze far field distance with maximum antenna dimensions
6	Analyze Rayleigh probability distribution function
7	Design & Simulate wireless channel equalization
8	Design channel estimation technique
9	Perform source coding on given signals
10	Understand wireless communication using Zigbee

VII Semester
IIOT2431: PE V: Cyber Security

Course Objective:

- To understand the basics of computer, network and information security.
- To study operating system security and malwares.
- To acquaint with security issues in internet protocols.
- To analyze the system for vulnerabilities.

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	Use cryptographic techniques in secure application development.
CO 2	Apply methods for authentication, access control, intrusion detection and prevention.
CO 3	Apply the scientific method for security assessment
CO 4	Develop computer forensics awareness.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3						3		
CO2	3	3	3	3	3	3						3		
CO3	3	3	3	3	3	3						3		
CO4	3				3	3						3		

Syllabus:

Unit	Content	Hours
1	An Overview of Information Security: The Basic Components, Threats, Policy and Mechanism, Assumptions and Trust, Assurance, Operational Issues, Human Issues, Security nomenclature. Access Control Matrix, Security Policies: Confidentiality, Integrity, Availability Policies and Hybrid Policies, OS Security	6
2	Modular Arithmetic : Modular Arithmetic Notations, Modular Arithmetic Operations, Euclid's method of finding GCD, The extended Euclid's algorithm. Cryptography : Classical encryption techniques, Block and Chain ciphers, Data Encryption Standard, Advanced Encryption Standard, RC5	`7
3	Chinese Remainder Theorem and its implication in Cryptography, Diffie-Hellman key exchange algorithm, RSA algorithm, Elgamal Arithmetic, Elliptic Curve Cryptography, Message Digest and Cryptographic Hash Functions, MD5 and SHA-1, Digital Signatures and Authentication.	7
4	Overview, Risk identification, Risk Assessment, Risk Control Strategies, Quantitative vs. Qualitative Risk Control Practices. Risk Management. Laws and Ethics in Information Security, Codes of Ethics, Protecting programs and data Cybercrime and Information security, Classification of Cybercrimes, The legal perspectives- Indian perspective, Global perspective,	7

	Categories of Cybercrime, Types of Attacks, a Social Engineering, Cyber stalking, Cloud Computing and Cybercrime.	
5	Public Key Infrastructure(PKI), X.509 Certificate, Needham Schroeder algorithm and Kerberos. IP Security: IPv6 and IPSec, Web Security: SSL, HTTPS, Mail Security: PGP, S/MIME . Firewall : Different Types and Functionalities	7
6	Phishing, Password Cracking, Key-loggers and Spywares, Types of Virus, Worms, DoS and DDoS, SQL injection, Buffer Overflow, Spyware, Adware and Ransomware. Antivirus and other security measures Intrusion Detection System : IDS fundamentals, Different types of IDS. Intrusion Prevention.	6

Text Books:

SN	Title	Edition	Authors	Publisher
1	Computer Security: Principles and Practices	6th Edition	William Stallings	Pearson
2	Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives		Nina Godbole, Sumit Belapure	Wiely India Pvt.Ltd,

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Applied Cryptography- Protocols, Algorithms and Source code in C, Algorithms	2nd Edition	Bruice Schneie	Wiely India Pvt Ltd
2	Cryptography and Security		CK Shyamala etc	Wiley India Pvt. Ltd
3	Cryptography and Network Security	2nd Edition	Berouz Forouzan	TMH
4	Information Security-Principles and Practices,	2007	Mark Merkow	Pearson

Website / Data sheet:

SN	Title
1	https://www.ibm.com/in-en/topics/cybersecurity
2	https://www.cisco.com/c/en_in/products/security/what-is-cybersecurity.html
3	https://www.itgovernance.co.uk/what-is-cybersecurity
	• SWAYAM: https://onlinecourses.swayam2.ac.in/nou19_cs08/preview • UDEMY: https://www.udemy.com/course/the-complete-internet-security-privacy-course-volume-1/ • COURSERA: https://www.coursera.org/specializations/intro-cyber-security • SIMPLILEARN: https://www.simplilearn.com/introduction-to-cyber-security-course

VII Semester
IIOT2432: PE V: Operating Systems for IIoT

Course Outcome: After completion of the course, student will demonstrate the ability to

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO -1	1	3	1	1	1	--	--	--	1	--	1	1	--	--
CO -2	1	3	3	3	2	--	--	--	1	--	1	1	--	--
CO -3	3	3	3	3	3	--	--	--	1	--	1	1	--	--
CO -4	3	2	3	--	--	--	--	--	1	--	1	1	--	--
CO -5	--	--	--	--	3	--	--	--	3	--	--	--	--	--

Syllabus:

Unit No.	Content	Max. Hrs.
1	Computer System organization, Architecture, Structure, Operations, Process Management, Memory Management, OS Services, User Operating System Interface, System Calls, System Programs (8 Hours)	7
2	Process Concept, Scheduling, Operations, Scheduling Criteria, Scheduling Algorithms, Tread Scheduling, Multiple Processor Scheduling (7 Hours)	7
3	Synchronization, Critical Section Problem, Semaphores, Deadlocks, System Models, Characterization, Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance (8 Hours)	7
4	Memory Management Strategies, Swapping, Continuous Memory Allocation, Paging, Segmentation, Virtual Memory Management, Demand Paging, Page Replacement, Trashing, (7 Hours)	7
5	File System Concept, Access Methods, Directory and Disk Structure, Mounting, Sharing, Mass Storage Structure, Disk Attachment, Scheduling, RAID Structure (8Hours)	7
6	Protection and Security, Domain of Protection, Access Matrix, Access Control, Language based Protection, Security Problem, System and Network Threats, Cryptography as Security Tool (7 Hours)	7

Text Books

SN	Title	Edition	Authors	Publisher
1	Operating System Concepts	10th	Abram Silberschatz	John Wiley & Sons
2	Modern Operating Systems		Andrewn Tanenbaum	PHI, India

Reference Books

SN	Title	Edition	Authors	Publisher
1	Operating Systems		Harvey Deitel	Pearson Education
2	Operating Systems		William Stallings	PHI, India
3	An Introduction to Operating Systems, Concepts and Practice		Pramod Chandra	PHI, India

VII Semester
IIOT2433: PE V: SQL & Non SQL

Course Objective:

1. To learn different database system concepts
2. To learn the designing of Entity Relationship Diagram.
3. To know relational data model, relational algebra & SQL Queries.
4. To understand relational database design.
5. To know about data integrity issues

Course Outcome: After completion of the course, student will demonstrate the ability to

CO 1	ze & compare different levels of abstraction & data independence.
CO 2	Design Entity Relationship Diagram for any scenario
CO 3	Solve queries based on relational algebra & SQL
CO 4	Identify functional dependencies & normalise the database

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2										3		
CO2		2	3							1		3	3	3
CO3					3	2				1		3	3	2
CO4		3	2							1		3	3	2
CO5		2										3	2	2

Syllabus:

Unit	Content	Hours
1	**Introduction to Database Management System:** General File System and Database system Concepts and Architecture, Data Models, Schemas and Instances, Abstraction & Different Levels of Data Abstraction, Data Independence: Logical & Physical Independence. Code of ethics for database designers.	05
2	**Entity-Relationship Model**: Entities and Entity Sets, Relationships and Relationship Sets, Attributes, Mapping Constraints, Keys, Entity Relationship Diagram, Reducing E-R Diagrams to Tables, Generalization, Aggregation, Design of an E-R Database Scheme	07
3	**SQL:** Data definition language (DDL), Data Manipulation Language (DML), Basic structure of SQL Queries, Set operations, Null Values, Nested subqueries, views, modification of database, transaction, Joins	07

4	**Advanced SQL:** SQL data types & schemas, Integrity Constraints, Domain Constraints, Assertions, triggers, Advanced SQL Features.	06
5	**Relational Data Model**: Structure of Relational Databases **Relational Algebra**: Structure of relational databases, Fundamental Relational-Algebra Operations, Additional relational algebra operations, extended relational algebra operations, modification of the databases.	07
6	**Relational Database Design**: Pitfalls in Relational Database Design, Functional Dependencies, Normalization using Functional Dependencies, Alternative Approaches to Database design.	06

Text Books:

SN	Title	Edition	Authors	Publisher
1	Database System Concepts	6th Edition	Korth, Silberschatz	McGraw-Hill

Reference Books:

SN	Title	Edition	Authors	Publisher
1	Database Systems	3rd edition	Connolly	Pearson Education

Website / Data sheet:

SN	Title
1	Database System Concepts - https://homepages.cwi.nl/~manegold/teaching/DBtech/slides/
2	https://nptel.ac.in/courses/106105175

VII Semester

IIOT2409 : Industrial IoT based Mini Project-3

VII Semester
IIOT2410 : CRT

VIII Semester
IIOT2451:
Major Project/ Industrial Internship Evaluation

VIII Semester

IIOT2452: Extra Curricular Activity Evaluation