



QUALIFICATION FILE

Technician Electronics and Instrumentation

- ☐ Short Term Training (STT) ☒ Long Term Training (LTT) ☐ Apprenticeship
☐ Upskilling ☐ Dual/Flexi Qualification ☐ For ToT ☐ For ToA
- ☒ General ☐ Multi-skill (MS) ☐ Cross Sectoral (CS) ☐ Future Skills ☐ OEM

NCrF/NSQF Level: 4.0

Submitted By:

NETTUR TECHNICAL TRAINING FOUNDATION

23/24, II PHASE, PEENYA INDUSTRIAL AREA,
BENGALURU – 560058, KARNATAKA

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Section 1: Basic Details

1.	Qualification Name	Technician Electronics and Instrumentation	
2.	Sector/s	Electrical and Electronics	
3.	Type of Qualification: ☒ New ☐ Revised ☐ Has Electives/Options ☐ OEM	NQR Code & version of existing/previous qualification: <i>(Change to previous, once approved)</i>	Qualification Name of existing/previous version: Technician Electronics and Instrumentation
4.	a. OEM Name b. Qualification Name <i>(Wherever applicable)</i>	NA	
5.	National Qualification Register (NQR) Code &Version <i>(Will be issued after NSQC approval)</i>	QG-04-EH-01402-2023-V1-NTTF	6. NCrF/NSQF Level: 4.0
7.	Award (Certificate/Diploma/Advance Diploma/ Any Other <i>(Wherever applicable specify multiple entry/exits also & provide details in annexure)</i>	Advance Certificate	
8.	Brief Description of the Qualification	The Candidate will be able to test and develop Electronics, Communication and Embedded System products. Will able to design and develop PCB Boards and electronics systems in Power Electronics, Electronic Instrumentation, Embedded system and IoT. The subjects covered in this Programme are –Analog and Digital Electronics, Analog Communication, PCBDesign, Computer Programming, Electronic Circuit Simulation, Electronic Instrumentation, Circuit Analysis, Industrial Electronics, Microcontroller and Applications, IoT and Employability Skills.	

9.	Eligibility Criteria for Entry for Student/Trainee/Learner/Employee	a. Entry Qualification & Relevant Experience:					
		Sl. No.	Academic/Skill Qualification (with Specialization - if applicable)			Required Experience (with Specialization - if applicable)	
		1	12th Pass with Mathematics OR 10th + 2 years ITI in the following trades: Technician Electronics System Design and Repair, Mechanic Consumer Electronic Appliances, Maintenance Mechanic (Chemical Plant), Technician Power Electronic Systems OR 10th + 2 years diploma /pursuing 3rd of diploma in relevant trade OR Certificate- Assistant Technician Electronics Assembly Level 3.5 From NTTF			NA	
10.	Credits Assigned to this Qualification, Subject to Assessment (as per National Credit Framework (NCrF))	Total Credits – 40				11. Common Cost Norm Category (I/II/III) (Wherever applicable): NA	
12.	Any Licensing requirements for Undertaking Training on This Qualification (wherever applicable)	NA					
13.	Training Duration by Modes of Training Delivery (Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)	☐ Offline ☐ Online ☒ Blended					
		Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT/Project Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)
		Classroom (offline)	480	570	90	NIL	1140
		Online	60				60
(Refer Blended Learning Annexure for details)							
14.	Aligned to NCO/ISCO Code/s (if no code is available mention the same)	NCO Code –2015/7311.0101					

15.	Progression path after attaining the qualification <i>(Please show Professional and Academic progression)</i>	Professional Progression: After Completion can work as Electronics and Instrumentation Technician. After Completion of Course and after 3 years of Industry Experience the Job Holder can work as Test Engineer, R&D Engineer, Servicing Engineer and Maintenance Engineer. Academic Progression: Diploma –Electronics Engineering and Embedded Systems(Level 4.5), Post Diploma, B VoC and B.Tech Degree Course in Relevant areas. After Completion of 3 years of Full Time Programme and after 3 years of Industry Experience the Job Holder Vertical Progression: Senior Technician - Engineer - Supervisor – Manager	
16.	Other Indian languages in which the Qualification & Model Curriculums are being submitted	Hindi	
17.	Is similar Qualification(s) available on NQR-if yes, justification for this qualification	☐ Yes ☒ No URLs of similar Qualifications: NA	
18.	Is the Job Role Amenable to Persons with Disability	☐ Yes ☒ No If “Yes”, specify applicable type of Disability:	
19.	How Participation of Women will be Encouraged	Yes - Admission open to women candidates (30% seats reserved)	
20.	Are Greening/ Environment Sustainability Aspects Covered (Specify the NOS/Module which covers it)	☐ Yes ☒ No	
21.	Is Qualification Suitable to be Offered in Schools/Colleges	Schools ☐ Yes ☒ No Colleges ☐ Yes ☒ No	
22.	Name and Contact Details of Submitting / Awarding Body SPOC <i>(In case of CS or MS, provide details of both Lead AB & Supporting ABs)</i>	Name: Mr. R Rajagopalan Position in the Organization: Joint Managing Director Email: rg@nttf.co.in Tel number: 080 – 28390215 Mobile Number: 9844013448 Website: nttfrg.com	
23.	Final Approval Date by NSQC: 30 Nov2023	24. Validity Duration: 3 years	25. Next Review Date: 30 Nov2026

Section 2: Module Summary**NOS/s of Qualifications** (In exceptional cases these could be described as components)**Mandatory Modules/NOS/s:** Specify the training duration and assessment criteria at NOS/ Module level. For further details refer curriculum document.– In Annexure
Th.-Theory Pr.-Practical OJT-On the Job Man.-Mandatory Training Rec.-Recommended Proj. -Project

Sl. No.	NOS/Module Name	NOS/ Module Code & Version	Core/ Non-Core	NCrF/ NSQF Level	Credit s as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) (if applicable)
Semester – 3																
1	Analog Electronics - 2	CP04301T	Core	4.0	19	60	-	-	-	60	100	-	-	-	100	
2	Digital Electronics - 2	CP04302T	Core	4.0		60	-	-	-	60	100	-	-	-	100	
3	Computer Programming – C, C++	CP04303T	Core	4.0		40	-	-	-	40	100	-	-	-	100	
4	PCB Design & Fabrication	CP04304T	Core	4.0		40	-	-	-	40	100	-	-	-	100	
5	Analog Communication	CP04305T	Core	4.0		40	-	-	-	40	100	-	-	-	100	
6	Analog Electronics – 2 Lab	CP04306P	Core	4.0		-	60	-	-	60	-	80	-	20	100	
7	Digital Electronics 2 Lab	CP04307P	Core	4.0		-	60	-	-	60	-	80	-	20	100	
8	Computer Programming Lab – C, C++	CP04308P	Core	4.0		-	60	-	-	60	-	80	-	20	100	
9	PCB Design and Fabrication Lab	CP04309P	Core	4.0		-	40	-	-	40	-	80	-	20	100	
10	Analog Communication Lab	CP04310P	Core	4.0		-	40	-	-	40	-	80	-	20	100	
11	Simulation Lab	CP04311P	Core	4.0		-	40	-	-	40	-	80	-	20	100	
12	Employability Skills	CP04312T	Core	4.0		30	-	-	-	30	75	-	-	25	100	
Duration (in Hours)/ Total Marks					19	270	300	-	-	570	575	480	-	145	1200	
Semester – 4																
13	Circuit Analysis	CP04401T	Core	4.0	21	40	-	-	-	40	100	-	-	-	100	
14	Electronic Instrumentation & Measurement	CP04402T	Core	4.0		40	-	-	-	40	100	-	-	-	100	
15	Microcontroller & Applications	CP04403T	Core	4.0		60	-	-	-	60	100	-	-	-	100	
16	Computer Programming – Python and Data Base	CP04404T	Core	4.0		40	-	-	-	40	100	-	-	-	100	
17	Industrial Electronics	CP04405T	Core	4.0		60	-	-	-	60	100	-	-	-	100	
18	Circuit Analysis Lab	CP04406P	Core	4.0		-	50	-	-	50	-	80	-	20	100	

19	Electronic Instrumentation & Measurement Lab	CP04407P	Core	4.0	-	40	-	-	40	-	80	-	20	100	
20	Microcontroller & Applications Lab	CP04408P	Core	4.0	-	60	-	-	60	-	80	-	20	100	
21	Computer Programming-Python and Data Base Lab	CP04409P	Core	4.0	-	30	-	-	30	-	80	-	20	100	
22	Industrial Electronics Lab	CP04410P	Core	4.0	-	50	-	-	50	-	80	-	20	100	
23	IoT – 1 Lab	CP04411P	Core	4.0	-	40	-	-	40	-	80	-	20	100	
24	Employability Skill	CP04412T	Core	4.0	30	-	-	-	30	75	-	-	25	100	
25	OJT	CP04413P	Core	4.0	-	-	90	-	90	-	75	-	25	100	
Duration (in Hours)/ Total Marks					21	270	270	90	-	630	575	555	-	170	1300
Total for 1-year Programme					40	540	570	90	-	1200	1150	1035	-	315	2500

Elective Modules/NOS/s: NA

S. No	NOS/Module Name	NOS/Module Code & Version (if applicable)	Core/ Non-Core	NCrF/NSQF Level	Credits as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) (if applicable)
1.																
2.																
Duration (in Hours) / Total Marks																

Optional Modules/NOS/s: NA

S. No	NOS/Module Name	NOS/Module Code & Version (if applicable)	Core/ Non-Core	NCrF/NSQF Level	Credits as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) (if applicable)
1.																
2.																
Duration (in Hours) / Total Marks																

Assessment - Minimum Qualifying Percentage

Please specify **any one** of the following:

Minimum Pass Percentage :(Every Trainee should score specified minimum aggregate passing percentage at qualification level to successfully clear assessment)

To pass the Qualification, every trainee should score minimum of 40% in each Theory, 50% in Practical and 60%in Project work / Internship and viva-voce.

Section 3: Training Related

1.	Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)	Diploma in relevant field with 3 years of trainer or industry experience B. Tech or BE with 2 years of trainer or industry experience
2.	Master Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)	Diploma in relevant field with 5 years as trainer industry experience B. Tech or BE with 5 years of trainer + industry experience
3.	Tools and Equipment Required for Training	☒ Yes ☐ No (If "Yes", details to be provided in Annexure)
4.	In Case of Revised Qualification, Details of Any Up skilling Required for Trainer	NA

Section 4: Assessment Related

1.	Assessor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Diploma with 4 years of trainer or Industry experience B. Tech or BE with 3 years as trainer or industry experience
2.	Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Diploma or B. Tech or BE with 2 years of experience
3.	Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Diploma with 4 years as trainer or industry experience B. Tech or BE with 3 years as trainer or industry experience
4.	Assessment Mode (Specify the assessment mode)	Blended theory (online and offline in the centre) and practical
5.	Tools and Equipment Required for Assessment	Same as for training ☒ Yes ☐ No (details to be provided in Annexure-if it is different for Assessment)

Section 5: Evidence of the need for the Qualification*Provide Annexure/Supporting documents name.*

1.	Research Reports: The following reports establish the Skilled Resource requirement for the electronics Industries. 1. MSDE Annual Report 2021- 2022 predict very high growth in Electronics and Automobile sector in India. 2. MSDE/ NSDC Human Resources and Skill Requirements in Electronics and IT Hardware report (2013- 17, 2017–22) The Report Forecast a Higher growth in Electronics and IT Hardware sector. 3. Human Resources and Skill Requirements in Telecommunications sector report (2013-17, 2017 –22) The Report Forecast a Higher growth in Telecommunications sector. 4. Human Resources and Skill Requirements in Healthcare sector report (2013- 17, 2017 –22) The Report Forecast a Higher growth in Electronics and IT Hardware sector. 5. Annual reports 2021 – 22 of Ministry of Electronics and Information Technology Government of India The above Studies has found Higher growth in Electronics and IT Industries.
2.	Latest Market Research Reports or any other source (not older than 2 years) (Yes/No): The following reports establish the Skilled Resource requirement for the Electronics and Automobile Industries 1. Indian Skills Report 2021-22 by Wheebox – partnered CII predicts skill requirement in Engineering and Manufacturing sectors, Pharma & Health care Sector, Software/Hardware & IT sector 2. Study on T& A Consulting, The Indian Electronics Industry 3. The Study has found Test Engineer, R & D Engineer, Hardware Designer has new job roles emerging in the Manufacturing Sector. 4. Indian cellular and Electronics research report predicts very high growth in Domestic manufacturing and export of Electronics Manufacturing in India.
3.	Government /Industry initiatives/ requirement (Yes/No): Yes – - MSDE/ NSDC Human Resources and Skill Requirements in Electronics and IT Hardware report (2013- 17, 2017–22) The Report Forecast a Higher growth in Electronics and IT Hardware sector. - National Policy for skill Development and Entrepreneurship 2015 by MSDE has predicted skilled manpower requirement across key sectors by 2022 and has framed many initiatives.
4.	Number of Industry validation provided: 36
5.	Estimated nos. of persons to be trained and employed: 400 / year
6.	Evidence of Concurrence/Consultation with Line Ministry/State Departments: (Letter to be sent to the concerned ministry and copy attached) If “No”, why: Under Process

Section 6: Annexure & Supporting Documents Check List

Specify Annexure Name / Supporting document file name.

1.	Annexure 1: NCrf/NSQF level justification based on NCrf Level / NSQF descriptors (<i>Mandatory</i>)	Yes
2.	Annexure 2: List of tools and equipment relevant for qualification (<i>Mandatory, except in case of online course</i>)	Yes
3.	Annexure 3: Industry Validations Summary	Yes
4.	Annexure 4: Training & Employment Details	Yes
5.	Annexure 5: Blended Learning (<i>Mandatory, in case selected Mode of delivery is “Blended Learning”</i>)	Yes
6.	Annexure 6: Detailed Assessment Criteria (<i>Mandatory</i>)	Yes
7.	Annexure 7: Assessment Strategy (<i>Mandatory</i>)	Yes
8.	Annexure 13: Multiple Entry-Exit Details (<i>Mandatory, in case qualification has multiple Entry-Exit</i>)	No
9.	Annexure: Acronym and Glossary (<i>Optional</i>)	Yes
10.	Supporting Document: Model Curriculum (<i>Mandatory – Public view</i>)	Digital content available to trainees through Edusquares ERP (Will be made public after the qualification is approved)
11.	Supporting Document: Career Progression (<i>Mandatory – Public view</i>)	Yes (Annexure-9)
12.	Supporting Document: Occupational Map (<i>Mandatory</i>)	Yes (Annexure-11)
13.	Supporting Document: Assessment SOP (<i>Mandatory</i>)	Yes (Annexure-10)
14.	Supporting Document: Key Learning Outcome	Yes (Annexure-12)
15.	Any other document you wish to submit:	No

Annexure -1 Evidence of Level

NCrF/NSQF Level Descriptors	Key requirements of the job role/ outcome of the qualification	How the job role/ outcomes relate to the NCrF/NSQF level descriptor	NCrF/NSQF Level
Professional Theoretical Knowledge/Process	- Explain different amplifiers and their application. - Explain Op amp – characteristics, parameters, and its applications. - Explain the Working of sensors & transducers. - Explain Microprocessor architecture and programming. - Explain Microcontroller architecture and programming. - Describe various types of Communications systems (Microwave, RADAR, Satellite, Optical etc.). - List various semiconductor memories - Describe the Power devices and its characteristics - Explain EMI & EMC	- Analyse various amplifiers and derive their parameters. - Design and implement transistor amplifiers. - Design and implement different applications of Op-amp. - Measure different electrical parameters. - Select the appropriate communication system for applications. - Choose the right memory as per the requirement. - Read & comprehend the datasheet of Electronic Components. - Analyze, design & program the various Memory ICs	4.0

Professional and Technical Skills/ Expertise/ Professional Knowledge	- Write the programs using C. - Data base management using C & Python. - Explain various Display Device & drivers. - Demonstrate the working of Sequential Circuits - Explain the architecture, codes and perform programming of Micro-controllers. - Describe the construction and characteristics of different sensors and transducers - Describe PCB Design and Fabrication using application software. - Explain regulated Power supply - Simulation and Testing of Power Circuits. - Explain IoT applications.	- Proficient in applications of Computer programming principles specific to his/her Domain to implement, debug and test programs - Analyse & implement various display devices with suitable drivers. - Analyse, design and implement sequential logic circuits. - Design and develop any microcontroller application circuits - Perform Maintenance and troubleshooting of Power Systems - Design fixed and variable power supplies with protection circuits. - Design, analyse and troubleshoot simple Power circuits. - Develop and troubleshoot IoT based systems	4.0
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	- Explain Diversity, inclusion, gender sensitivity. - Describe Goal setting and career development. - Describe Analytical thinking and adaptive thinking. - Explain about Financial & Legal literacy. - Specify Occupational Safety, Health, and Environment education.	- Propagate inclusiveness and team working. - Propagate Personal development & team building. - Developing creativity and reasoning, making decisions in dynamically challenging situations. - Good understanding of various statutory and legal benefits and requirements of an employee. - Knowledge of Occupational safety hazards and methods to mitigate them.	4.0

Broad Learning Outcomes/Core Skill	- Practical hands-on experience on Power electronics, - Knowledge on Computer Programming using different programming languages. - Perform programming of Micro-controller and its applications. - Knowledge on PCB Design & Fabrication	- Maintenance and troubleshooting of Power Systems - Can Program using C, C++, Python and other software currently in use as per the applications. - Design and develop microcontroller application circuits. - Apply his/her skill and knowledge to Design PCB	4.0
Responsibility	- Awareness of safety Procedures and SOPs in the relevant work area. - Identify, monitor & report occurrences in the work area. - Test and calibrate the equipments	- Work effectively in any component assembly. Assist Maintenance activity in industry. - Can work independently. - Able to assemble, install, test and calibrate Equipments and products in relevant field	4.0

Annexure 2: Tools and Equipment (Lab Set-Up)
List of Tools and Equipment for a batch of 30 trainees
MICROCONTROLLER & EMBEDDED SYSTEM LAB

Sl. No.	Equipment	Specification	Quantity
1	Microcontroller Trainer Kit	8051 /AT89S52 Development Board with Interfacing Modules.	10
2	IoT Trainer Kit	Node MCU, Arduino, Raspberry Pi	7
3	Sensor Trainer Kit with Assorted Sensors		1

ELECTRONICS & MEASURING SYSTEM LAB

Sl. No.	Equipment	Specification	Quantity
1	Digital Storage Oscilloscope with Current Probe	No of Channels - 2, Bandwidth: DC - 20 MHz	10
2	Dual - Power Supplies Regulated Power Supply, Adjustable	0-30V/1A	10
3	Dual - Fixed Power Supply	15-0-15 V/2A	10
4	Function Generator	Frequency Range: 0.3 Hz to 3 MHz, Functions: Sine, Square, Triangle, DC Sweep	10
5	Pulse Generator	20MHz	10
6	AC Drive /VFD		3
7	DC Drive		3
8	Displacement Measuring system		3
9	Force measuring system		3
10	Pressure measuring System		3
11	Speed Measuring System		3
12	Digital Temperature Controller		3

COMPUTER LAB

Sl. No.	Equipment	Specification	Quantity
1	Server	Intel Xeon Processor, 2.8GHz 8M Cache, 2TD SSD, RPS.	1
2	Networked Computers with Furniture	Core i5 10th Gen 23.8-inch FHD with Alexa (8GB/256 GB SSD+1TB HDD/Windows 10/MS Office	10
3	UPS	5kVA	1
4	LED Smart TV	73"	1

Note:

- The Tools and Equipments and other lab facilities are shared between Qualifications and batches.
- During the admission the trainees are supplied with toolkit containing DMM, soldering iron, Breadboard, and other tools for conducting experiments in different labs.
- Trainees are provided with Laptop.

Classroom Aids

The aids required to conduct sessions in the classroom are:

1. Black / white board.
2. Projector with screen / Smart TV
3. Laptop / computer

Annexure 3: Industry Validations Summary

Provide the summary information of all the industry validations in table. This is not required for OEM qualifications.

Sl. No	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID	LinkedIn Profile (if available)
1	Tata Power SED Limited (Presently TASL)	Mrs.Mahima		Electronics city, Bangalore	8067859900	mahima@tatapowerSED.com	
2	L&T Infotech Limited	Mr.joji George		saki vihar road, Powai ,Mumbai	2267766776	joji.george@lntinfotech.com	
3	National Instruments india Limited	Mr.yogesh Sundaramurthy		7th block, Koramangala, Bangalore	8051190000	yogesh.sundaramurthy@ni.com	
4	Lucas -TVS Limited	Mr.Kamalakaran D		Padi, Chennai	4426235515	kamalakannan.engg@lucastvs.co.in	
5	Coreel Technologies Limited	Mr Harish		21,7th main, 1st Block, Koramangala	080 41970400	harish@coreel.com	
6	Tessolve India Limited	Mrs.Shoba Annamalai		Tessolve Services Pvt Ltd, Plot No.31, Electronics City Phase II	8041812626	shoba.annamalai@tessolve.com	
7	Samsung India Limited	Mr.Suresh		Block - 'B', 66/1, Bagmane Tech Park, Byrasandra C V Raman Nagar,	9845408281	s.suresh@samsung.com	
8	Delopt India	Ms.Seema		3 & 4, 1st Cross, 7th Main, J C Industrial Area, Off Kanakapura Main Road, J C Industrial Area	080-26668286	seema@delopt.co.in	
9	Wipro Technologies	Mr.Anjana Varma		No 72, Keonics Electronic City,	7259034096	anjana.varma@wipro.com	
10	Syscon Instruments	Ms.Gayatri		plot #66, Hosur road , Electronics city	91 80 28520772/3/4	gayatri@sysconinstruments.com	
11	Centum	Mr.Jason		44 Yelanhka New Town, KHB Industrial Area , Bangalore	91 80 41436000	agnellaj@centumelectronics.com	
12	Techno Sphere	Ms. Rohini		7, 1st East Main, ITI Layout, BSK 3rd Stage,	91-80-4171-1409	nk@technosphereindia.in	
13	Ecopower	Mr.Mohan		551, 14TH Main Sector 7,	9980585005	mohan@ecopower.in	

				HSR Layout , Bangalore			
14	Radel Electronics	Mr. Manjunath		No.74/D, Hosur Road Electronics city , Bnagalore	9342420720/80 -28520720	hr@radel.in	
15	Sun Micro Components	Rakesh a bagadi		New city complex ,SN 101 to106 #13/30 to 13/35,1 st floor NR road cross	080-22293923	techsupport@sunmicrocomp onents.com	
16	Gemini Communications	Malakrishna TC		#1, Dr ranga road ,2 street , allwarpet, chennai	044-24996422	info@qci.in	
17	Park Controls	Ms. Manisha		#22,80 feet road , HAL, 3 rd stage ,	080-25297199	info@parkscontrols.com	
18	APLAB (team lease)	Mr. Deepak		BMTC complex ,6 th floor ,80 feet road , Koramangala	080-33002345	Deepak.p@aplab.com	
19	Unique tech integration	Savan G Gangadhol		#42/A9th a main BTM Layout , 1 st stage	080-25525546	blr@uniquetech.com	
20	Neuro synaptic	Mrs. Rich Kumar		10, 3RD floor, Next to swetha bakery, 29 th main, BTM layout 2nd stage	080-41313168	richa@neurosynaptic.com	
21	Panacea Medical Technologies	Mrs.Ambika		Plot # 119, Envision Technology Center, EPIP Area Phase 1, Whitefield.	080- 4242 8700	careers@panaceamedical.co m	
22	Micropack limited	Mrs. Lakshmi		Plot No 16,Jigani Industrial Area, Anekal Taluk	7760976713	hr@micropack.com	
23	All 3 Axes	Mr.Senthil		#32, 1st Floor, Krishna Reddy Layout, Domlur	9739469620	senthil@all3axis.com	
24	Juno Tele	Mr.Vikas		4th Block, Pattabhirama Nagar, Jayanagar, Bengaluru	8041477477	Vikas@junotele.com	
25	Source Technologies	Mr.Prasanth		# 67, Govindappa Road, Basavanagudi,	80-26571838	Prashanth@sourcetechnologi. com	
26	Rossel Techsys	Ms. Jenniffer		plant at No. 74, 3rd	7259821385	jennifer.james@rosselltechsys	

				cross, Export Promotion Industrial Park, Whitefield,		.com	
27	Usha Martin	Mr. Raju		2A,Shakespeare Sarani, 'Mangal Kalash' ,Kolkata 700071	9339800300/39800458	contact@ushamartin.co.in	
28	Qualcomm India Private Limited	Shailesh kumar		Bangalore	8892631728	kumarsha@qti.qualcomm.com	
29	Tata Cummins Pvt Ltd.	Phanindra Mishra		Pune	9264499320	phanindra.mishra@cummins.co	
30	Frauscher Sensor Technology	Poornima		Bangalore	8904062133	poornima.krishna@in.frauscher.com	
31	Amossys Digital Pvt Ltd	Raghavendra S		Jharkhand	7980095043	rajeev.k@acsg.co.in	
32	HTL	Rani Drairaj		Tamilnadu	9843683156	ananda.shankar@htlchennai.com	
33	Zenco India Pvt Ltd	Keshav Singh		Karnataka	9739993901	keshavksingh@zincoelectric.com	
34	Infosys	Richard Lovo		Karnataka	8028520261	askus@infosys.com	
35	Micromatic Machine Tools Pvt. Ltd.	Srinivasa V		Karnataka	080 4943 3100	srinavasav@acemicromatic.com	
36	Wistron	Ms Renuka prasad		Kolar	9008854352	renukaprasad_sg@wistron.com	

Annexure 4: Training & Employment Details

Training and Employment Projections: *Data to be provided year-wise for the next 3 years.*

Year	Total Candidates		Women		People with Disability	
	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities
2023	300	More than 3000	150	More than 2000	-	
2024	400	More than 3000	200	More than 2000	-	
2025	500	More than 3000	250	More than 2000	-	

Training, Assessment, Certification, and Placement Data for previous versions of qualifications: (Previous years)

Qualification Version	Year	Total Candidates				Women				People with Disability			
		Trained	Assessed	Certified	Placed / Higher Studies	Trained	Assessed	Certified	Placed / Higher Studies	Trained	Assessed	Certified	Placed
	2017- 2020	196	183	163	163	56	51	45	45	NIL			
	2018 - 2021	150	146	142	142	39	36	35	35				
	2019 - 2022	167	155	146	146	46	41	36	36				

Applicable for revised qualifications only, data to be provided year-wise for past 3 years.

List Schemes in which the previous version of Qualification was implemented:

2nd year of three years Full Time Programme

Content availability for previous versions of qualifications:

☐ Participant Handbook ☐ Facilitator Guide ☒ Digital Content ☐ Qualification Handbook ☒ Any Other: In NTTF LMS and Edusquares ERP

Languages in which Content is available: English.

Annexure 5: Blended Learning**Blended Learning Estimated Ratio & Recommended Tools:**

Refer NCVET “Guidelines for Blended Learning for Vocational Education, Training & Skilling” available on:

<https://ncvet.gov.in/sites/default/files/Guidelines%20for%20Blended%20Learning%20for%20Vocational%20Education,%20Training%20&%20Skilling.pdf>

S. No.	Select the Components of the Qualification	List Recommended Tools – for all Selected Components	Offline: Online Ratio
1	Theory/ Lectures - Imparting theoretical and conceptual knowledge	Physical classroom, LMS, Web based	90:10
2	Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners	Physical classroom, Workshops, Mock sessions, Case study, Role play, Group Discussions, LMS	90:10
3	Showing Practical Demonstrations to the learners	Workshop / Lab, Video recording, Simulators	80:20
4	Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	Workshop machines, Lab equipment, Simulators, Mini projects, Project	80:20
5	Tutorials/ Assignments/ Drill/ Practice	Class assignments, LMS assignments, Simulators	60:40
6	Proctored Monitoring/ Assessment/ Evaluation/ Examinations	Physical classroom, Labs, Workshop, Quiz tests, Project	75:25
7	On the Job Training (OJT)/ Project Work Internship / Apprenticeship Training	Industry	100:00

Annexure 6: Detailed Assessment Criteria

Detailed assessment criteria for each NOS/Module are as follows:

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Semester – 3					
Analog Electronics - 2	Transistor Amplifiers - Voltage gain, Current gain & power Gain, DC and AC analysis of CE amplifier, Swamped amplifier, Common Collector amplifier and multistage amplifiers	20	-	-	-
	Operational Amplifiers –Parameters, Packages and its specifications, Interpretation of datasheets	10	-	-	-
	Applications of Op-Amp – analysis of closed loop circuits and open loop circuits and its applications	40	-	-	-
	Oscillators –Need, working principles of transistor and Op amp based oscillators	10	-	-	-
	Power Amplifier - Need for Power Amplifier, Classification, DC and AC analysis, Calculation of input power, output power and efficiency	20	-	-	-
	Total Marks	100			
Digital Electronics - 2	Latches & Flip-Flops –Types, logical operation and applications	20	-	-	-
	Sequential Logic Circuits- Counter Types, Modulus of a counter, Cascading Counters, Applications ,Shift Registers & its types, Universal Shift Register IC's, Ring Counter and Johnson Counter applications	30	-	-	-
	Data Converters -Digital to Analog & Analog to Digital Converter – types, working, ICs and applications	20	-	-	-
	Semiconductor Memories –Introduction to memories- Classification, Comparison and application, Applications of Programmable Logic Array, Programmable Array Logic, Complex Programmable Logic Devices and Field Programmable Gate Array	15	-	-	-
	Display Devices & Drivers – Classification, working and applications, Comparison of Various displays	15	-	-	-

	Total Marks	100			
Computer Programming – C,C++	Introduction to Computer programming - Tools used with Compiler, Features, Tokens, Data types, Variables, storage classes, Header files and applications of C	20	-	-	-
	Operators and Expressions – Arithmetic, Relational, Logical, Bitwise, Assignment operators	10	-	-	-
	Control statements - Decision Making, Decision Making, Looping Statements, Break, Continue, Goto statements	20	-	-	-
	Arrays -Declaration and Initialization of Single dimensional and Multidimensional array, strings in C	10	-	-	-
	Functions - Elements of Function, Library and user defined functions, Scope of variables, Recursive Function, String Functions	10	-	-	-
	Pointers & Miscellaneous Topics - declaration and definition, Pointer arrays, Call by Value & Call by Reference, C - Pre-processor, Memory Allocation in C	10	-	-	-
	Structure & Union - Declaration & Accessing members in C Program	10	-	-	-
	C++ Introduction and oops Concepts – Benefits, Structure and its Applications, Class and its scope	10	-	-	-
	Total Marks	100			
PCB Design & Fabrication	Eagle-Basic concepts –Installation, Schematic design using Eagle software	15	-	-	-
	Manufacturing of Copper clad Laminates –Types, Properties and manufacturing procedures of Copper Clad Laminate	5	-	-	-
	Layout general Rules & parameters -Wave soldering, SMT Technology	12	-	-	-
	PCB Layout Design - Component placement , routing and single and multi layer PCB	15	-	-	-
	Layout planning – Signal coupling, general rules and Troubleshooting	10	-	-	-
	Photo Printing –photo printing Procedures	8	-	-	-

	Plating –Classification and application	10	-	-	-
	Etching – Types and chemicals used	10	-	-	-
	Mechanical Machining Operations –Punching, shearing, Sawing, Routing and CNC/ LASER Drilling	10	-	-	-
	Multilayer PCB	5	-	-	-
	Total Marks	100			
Analog Communication	Electrical networks – Characteristics of passive filters, Types of resonance and applications, Classification and applications of Attenuators and Equalizers	15	-	-	-
	Communication Basics – Introduction to Communication system, Need for Modulation, Analog Modulation techniques, Spectrum of FM, Applications of Narrow band and Wideband FM, Types of noise & its Effects	30	-	-	-
	Transmission Lines - Introduction to transmission lines and its classification, Cables used and its specification, Electrical model of transmission line	10	-	-	-
	Broadcast and Television Technology - Introduction to Antennas & Types, Television system and standards used, Types and working of Microphones and Loudspeakers	15	-	-	-
	Radar Communication – Types, Principle and applications	10	-	-	-
	Optical and Satellite Communications – Optical fibre Parameters, Fibre optic sources and Optical detection, communication networks-LANs, WANs and MANs, Types of satellite systems and Communication principle	20	-	-	-
	Total Marks	100			
Employability Skill	Diversity and Inclusion, Gender sensitivity PwD etc.	15	-	-	5
	Career development & Goal setting	20	-	-	5
	Entrepreneurship	20	-	-	5
	Analytical thinking & Adaptive Thinking	20	-	-	10

	Total Marks	100			
Analog Electronics – 2 Lab	To verify the frequency response and ac and dc analysis of RC Coupled CE amplifier, CE-CC amplifier	-	15	-	5
	Design the Op amp application circuits - Inverting amplifier, non-inverting amplifier, Summing Amplifier, Difference Amplifier, Integrator and Differentiator, Comparator, Zero Crossing Detector, Schmitt trigger, active filters, Instrumentation amplifier, Peak detector, Astable and Monostable multivibrator	-	50	-	5
	To Demonstrate Op amp and transistor-based Oscillators	-	10	-	5
	Construction and testing of Class B/Class AB push pull amplifiers	-	5	-	5
	Total Marks	100			
Digital Electronics 2 Lab	To implement flip flops using Logic gates	-	5	-	5
	Interpretation of data sheets	-	5	-	-
	To Implement latches and flip flops using ICs	-	15	-	5
	To verify Ripple counter	-	5	-	-
	Design and Implement Mod-6 /Decade Ripple Up Counter using D-FF IC	-	10	-	-
	To Implement Asynchronous and synchronous Decade Counter using IC	--	5	-	-
	Design and Implement SISO, PIPO using D-FF IC	-	10	-	5
	Design a 3-bit Bidirectional Shift Register using IC	-	5	-	-
	Implement 4-bit Shift Register using IC	-	5	-	-
	Design and Implement 3-bit Ring Counter using D-FF IC	-	5	-	-
	Design and Implement 3-bit Johnson Counter using D-FF IC	-	5	-	-
	To verify DAC and ADC	-	5	-	5
	Total Marks	100			
	C, C++ Lab – Perform programs using C, C++ commands for various exercises	-	80	-	20

Computer Programming Lab – C, C++	Total Marks	100			
PCB Design and Fabrication Lab	Types and Properties of copper clad Sheet. Design layout for different technology of PCBs.	-	10	-	5
	PCB design and Fabrication process.	-	10	-	5
	PCB design of different circuit layouts using EAGLE software. - Exercises	-	50	-	5
	PCB development process understanding.	-	10	-	5
	Total Marks	100			
Analog Communication Lab	To verify the frequency response of RC & LC filters	-	40	-	10
	Demonstrate the characteristics of series and parallel resonant circuit	-	20	-	5
	To test AM & FM Generator and detector	-	20	-	5
	Total Marks	100			
Simulation Lab	Practice of wiring of various electronic circuits and testing on LT Spice Simulation software	-	80	-	20
	Total Marks	100			
Semester – 4					
Circuit Analysis	Basics of Circuit Analysis – Analysis of AC and DC circuits by applying various network theorems	20	-	-	-
	Circuit analysis of power supply –Types, Applications and protections used in a power supply	30	-	-	-
	Circuit Analysis of Function Generator –Analysis of various signal generation in a function generator, analysis and measurement at test points	20	-	-	-
	Phase Locked Loop –Blocks and applications	20	-	-	-
	EMC and EMI –Introduction and EMC measures- shielding, grounding and filters	10	-	-	-
	Total Marks	100			

Electronic Instrumentation & Measurement	Introduction - Functional elements of an instrument and its Performance characteristics	30	-	-	-
	Electrical Measuring Instruments –Types, working and applications	30	-	-	-
	Electronic Measuring Instruments - Types, working and applications	20	-	-	-
	Process Measuring Instruments - Types, working and applications of Sensors and transducers	20	-	-	-
	Total Marks	100			
Microcontroller & Applications	Introduction to Microprocessors and Microcontrollers - Evolution of Microprocessors and Microcontrollers, comparison and applications in industry	10	-	-	-
	Study of Memory - Memory Model, Memory Map and Addresses, Memory Classification, Memory Decoding	10	-	-	-
	8051 Architecture –features, Architecture of 8051, I/O ports and Memory organization	10	-	-	-
	Programming of 8051 -8051 addressing modes, Instructions set, 8051 assembly language programming in keil	20	-	-	-
	Timers and Interrupts of 8051 –configuration of internal peripherals and communication protocol	20	-	-	-
	8051 Application - Introduction to 8051 Programming in C –Interfacing of various peripherals	30	-	-	-
	Total Marks	100			
Computer Programming – Python and Data Base	Introduction of python -Installation of Python and run a Python program	10	-	-	-
	Python Data type, Decision making and Loops – Building blocks in python programming	20	-	-	-
	Tuples, Dictionaries, and Data Processing – Types and use	20	-	-	-
	Functions and Files – Types and file operation methods	20	-	-	-

	Python Object Oriented Programming –OOPs introduction	10	-	-	-
	Database concept - Introduction to Database System Database Applications and Data Models	10	-	-	-
	SQL - Introduction to SQL and use of SQL commands	10	-	-	-
	Total Marks	100			
Industrial Electronics	Introduction To Industrial Electronics - Introduction Power Electronics Vs. Linear Electronics, Construction, working and applications of Power Devices	15	-	-	-
	Application of Thyristor - Over voltage protection, Induction heating, Switch mode welding, Battery charger etc.	10	-	-	-
	Protection Circuits -Snubber Circuits and their Functions	5	-	-	-
	Phase controlled rectifier -Single phase and three phase controlled and uncontrolled rectifiers with resistive and inductive loads	15	-	-	-
	Choppers - Classification of choppers and its working principle	10	-	-	-
	Inverter-Need of inverter, Types and applications, Concept and types of PWM Technique	15	-	-	-
	Cyclo Converters - Single phase and three phase Cyclo Converter	10	-	-	-
	Power Supplies - Linear Power Supplies, Switching Power Supplies, Protection, Isolation and Specification	15	-	-	-
	Control of AC and DC drives - Need of Drives, Types and Applications	5	-	-	-
	Total Marks	100			
Employability Skill	Financial and Legal Literacy	15	-	-	5
	Occupation safety, Health, and Environment education.	20	-	-	10
	Digital Literacy Skills	20	-	-	5
	Essential skills for success.	20	-	-	5
	Total Marks	100			

Circuit Analysis Lab	To verify the network theorems	-	15	-	5
	Design of Series voltage regulators and its protection circuit	-	25	-	5
	Design regulated power supply for the given specification	-	15	-	5
	To test the line and load regulation of power supplies	-	15	-	2
	To generate the signals of a function generator	-	10	-	3
	Total Marks	100			
Electronic Instrumentation & Measurement Lab	Performance test on Function Generator, Pulse Generator, CRO and Power Supply	-	25	-	10
	To find the characteristics of PT – 100, Thermistor, Thermocouple, temperature sensor, LDR, Strain Gauge, LVDT, Proximity Sensor, IR Sensor, UV Sensor, PIR Sensor and Gas Sensor	-	55	-	10
	Total Marks	100			
Microcontroller & Applications Lab	To write an assembly language program to perform the arithmetic and logical operations in 8051 microcontrollers using Keil IDE	-	15	-	5
	To write an assembly language program to transfer the content from RAM locations	-	10	-	
	To write an assembly language program to perform 16-bit operations	-	5	-	5
	To write an assembly language program to test the different addressing modes	-	10	-	
	To write a C program for interfacing various I/O devices like Switches, Sensors, Motor, LCD etc.	-	20	-	5
	To write a C program/assembly program to configure internal peripherals	-	20	-	5
	Total Marks	100			
Computer Programming- Python and Data Base Lab	To write python program to verify various data types	-	15	-	5
	To write python program to test logical skill	-	10	-	5

	To write python program to test code optimization	-	15	-	
	To write python program to verify the usage of functions	-	25	-	5
	Demonstrate Database Applications	-	15	-	5
	Total Marks	100			
Industrial Electronics Lab	To analyse the magnetization and de-magnetization current of inductors	-	8	-	2
	Verify the characteristics of power devices	-	15	-	5
	Demonstrate the Reverse Recovery of Diode	-	10	-	-
	Demonstrate UJT as a relaxation oscillator and SCR firing circuits using UJT	-	7	-	3
	To verify the Characteristics of converters	-	15	-	5
	Demonstrate the applications of AC and DC drives	-	15	-	5
	Demonstrate the speed control of motor using PWM	-	10	-	-
	Total Marks	100			
IoT-1 Lab	To verify the Arduino basic programming	-	10	-	-
	To write Arduino programming for I/O operations, Serial Communication	-	15	-	5
	To interface Arduino with various peripherals	-	25	-	5
	To Configure NODE MCU for cloud applications	-	15	-	5
	To interface Arduino with various peripherals	-	5	-	5
	To control the appliances through mobile apps with Node MCU	-	10	-	-
	Total Marks	100			
OJT	Presentation	-	75	-	25
	Total Marks	100			

Annexure 7: Assessment Strategy

1 ASSESSMENT STRATEGY

The Criteria for assessment is based on Modules, and. will be assigned marks proportional to its importance.

The assessment for the semester-based qualification is carried out by conducting Formative and Summative Assessments.

Regarding Theory – Sessional is based on Intermediate Tests, File / Assignments & Viva –voce: Semester end examination wherein for each Individual batch, A&E dept. at Corporate office, Bangalore creates unique question papers for theory part as well as practical – Theory comprises MCQ and descriptive questions drawn randomly from Question Bank.

Regarding the practical part, the experiments/ exercises are performed by the trainees during the LAB Hours and the trainees are allowed to record the learning of it which will be carried as their Record Marks & one Lab Test and semester end examination. Semester end examination is outcome-based experiments/ exercises of the course will be given to trainees to perform and based on the performance the mark will be awarded. The passing criteria is based on practical's performance, viva or oral exam, Test and final semester end examination.

Theory and practical Examinations are carried out by Examiners under the overall supervision of the Assessment & Evaluation Dept.

Evaluation of Theory & Practical examination is carried out by the Trained Assessors (NTTF faculty members) under the supervision of Shopfloor Manager / senior faculty in a fair manner as per the assessment criteria set by A&E dept. of NTTF.

The Tabulation and processing of results shall be carried out under EDUSQUARE campus Software.

Assessment comprises the following components:

- Job carried out in Labs / workshops
- Record book
- ONLINE Examination
- Answer sheet of assessment
- Viva-voce
- Semester end examination
- ON-THE-JOB training
- Tech Talk / Shop Talk
- Extracurricular and Co-curricular Activities
- Projects
- Attendance and punctuality

2. ASSESSORS

Evaluation of Theory & Practical examination is carried out by the Trained Assessors (NTTF faculty members) in a fair manner as per the assessment criteria set by A&E dept. of NTTF.

Assessors / Faculties are trained from time to time to upgrade their skills on various aspects such as conduct of assessments, teaching methodology etc.

3 ELIGIBILITY TO APPEAR FOR THE EXAM:

- The candidates should have an attendance of a minimum 90% in a semester.
- The candidates should have secured minimum Sessional Marks in Theory & Practical

4 PASS CRITERIA:

To pass the Qualification, every trainee should score a minimum of 40% in each Theory and 50% in each Practical and 60% in OJT / Projects.

5 RESULTS AND CERTIFICATION:

The assessment results are backed by evidence collected by assessors. Successful trainees are awarded the Diploma certificate by NTTF Corporate Office.

6 ON THE JOB:

1. The candidate must score 60% to successfully complete the OJT.
2. Tools of Assessment that will be used for assessing whether the candidate is having desired skills and etiquette of dealing with customer needs & requirements and perform Soft Skills effectively:
 - Videos/photos of Trainees during OJT
 - Suggestions / Kaizens from trainees
 - Rewards and appreciation to trainees as applicable
3. Assessment will ensure the following:
 - Effective engagement with the customers
 - Understand the working of various tools and equipment.

7 SYSTEM OF GRADING:

An alphabetical letter grade will be assigned for each subject based on the total marks scored in the sessional and end semester examination.

Equivalent Grade Points are used: A = 9.5, B = 8.5, C = 7.5, D = 6.5, E = 5.5, F = 0 (FAIL), I = Incomplete (MP/AB/SP) Supplementary cleared = E

The student will be issued Semester Grade Report calculating SGPA / CGPA as follows:

$$\text{Semester Grade Point Average (SGPA)} = \frac{\sum (\text{No. of Credits} \times \text{Grade Point})}{\sum (\text{No. of Credits for the Program})}$$

$$\text{Cumulative Grade Point Average (CGPA)} = \frac{\sum (\text{SGPA} \times \text{total Credits of each semester})}{\text{Total credits Acquired.}}$$

Awarding of class:

a) Awarding of class for semester:

SGPA	Classification
8.5 and above	First class with distinction
7.5 to 8.4	First class
6.0 to 7.4	Second class
5.5 to 5.9	Pass class

b) Awarding of class for Programme:

First class with Distinction	Should have scored CGPA 8.5 and above and should have cleared all Semesters in the first attempt.
First class	Should have scored CGPA 7.5 to 8.4
Second class	Should have scored CGPA 6.0 to 7.4
Pass class	5.5 to 5.9

8 ASSESSMENT TOOLS

All assessment and evaluation activities are carried out under EDUSQUARE campus software which includes Formative assessment & Summative assessment.

- EDUSQUARE : NTTF ERP/CRM used for academic purpose EDUSQUARE erp.nttftrg.com used as SaaS (software as a service) mode
- Digital Valuation System: Digital Valuation system is an innovative software solution which automates manual evaluation and help institutions to minimize the time, effort and human errors in the entire valuation process.
- Remote proctoring which includes AI based Auto Proctoring, Student authentication & Multi secure Exam browser as and when the need arises.

List of ICT Tools:

Desktop and laptops
Interactive White Board
CCTV Camera
Pen Drive
Video Conferencing
Biometric

Edusquare: NTTF ERP/CRM used for academic purpose Edusquare erp.nttftg.com used as SaaS (Software as a Service) mode

Networking: Includes Wireless access Points, Switches, Routers, Controllers across all NTTF

AWS Cloud: AWS Cloud computing platform to host NTTF website www.nttftg.com and used as backup storage.

Firewall: Network security device protecting our network by filtering traffic and blocking outsiders.

Microsoft (O365/M-365) – Email/office (Word, Excel, PPT, One Drive for all staff/students are provided using Microsoft O365 MDM (BYOD) policies implemented through M365 used as SaaS

NSQC Approved

Annexure 8: Model Curriculum**Major Topics**

Semester - 3			Module Name: Analog Electronics - 2	Module code: CP04301T
Sl. No.	Module Details			Theory Hours 60
1	Transistor Amplifier			10h
2	Operational Amplifiers			4h
3	Applications of op-amp			22h
4	Oscillators			8h
5	Power Amplifier			16h

Semester - 3			Module Name: Digital Electronics - 2	Module code: CP04302T
Sl. No.	Module Details			Theory Hours 60
1	Latches and Flip-Flops			7h
2	Sequential Logic Circuits			23h
3	Data Converters			12h
4	Semiconductor Memories			11h
5	Display Devices and Drivers			7h

Semester - 3			Module Name: Computer Programming – C, C++	Module code: CP04303T
Sl. No.	Module Details			Theory Hours 40
1	Introduction to Computer programming			1h
2	Introduction to C programming language			6h
3	Operators and Expressions			3h

4	Control statements	6h
5	Arrays	3h
6	Functions	4h
7	Pointers and Miscellaneous Topics	5h
8	Structure and Union	2h
9	C++ Introduction and OOps Concepts	10h

Semester - 3 Module Name: PCB Design and Fabrication Module code: CP04304T		
Sl. No.	Module Details	Theory Hours 40
1	Eagle-Basic concepts	3h
2	Manufacturing of Copper clad Laminates	7h
3	Layout general Rules and parameters	3h
4	PCB Layout Design	4h
5	Layout planning	4h
6	Photo Printing	5h
7	Plating	5h
8	Etching	3h
9	Mechanical Machining Operations	3h
10	Multilayer PCB	3h

Semester - 3 Module Name: Analog Communication Module code: CP04305T		
Sl. No.	Module Details	Theory Hours 40

1	Electrical networks	7h
2	Communication basics	10h
3	Transmission lines	3h
4	Broadcast and television technology	5h
5	Radar communication	5h
6	Optical and satellite communications	10h

Semester - 3		Module Name: Employability Skills	Module code: CP04312T
Sl. No	Module Details		Theory Hours 30
1	Diversity and Inclusion, Gender sensitivity PwD etc.		8h
2	Career development & Goal setting		6h
3	Entrepreneurship		6h
4	Analytical thinking & Adaptive Thinking		10h

Semester – 3		Module Name: Analog Electronics – 2 Lab	Module code: CP04306P
Sl. No.	Module Details		Practical Hours 60
1	Frequency response of RC Coupled CE amplifier –Zin & Zout		3h
2	CE-CC Cascading Amplifier		3h
3.1	Connecting Single Rail and Dual Rail to Op amp		3h
3.2	Voltage follower		
4	Inverting amplifier and virtual ground concept		3h
5	Non-Inverting amplifier and virtual short		3h
6	Revision Lab		3h

7	Inverting and Non-Inverting Summing Amplifier	3h
8	Difference Amplifier	3h
9	Revision Lab	3h
10	Integrator and Differentiator	3h
11	Comparator and Zero Crossing Detector	3h
12	Schmitt trigger	3h
13	Astable and Monostable multivibrator	3h
14	Op amp active filters- LPF, HPF	3h
15.1	Three Op amp instrumentation amplifier: Check on CMRR	3h
15.2	Instrumentation amplifier IC – AD 624	
16	Op amp based Peak detector	3h
17.1	RC phase shift oscillator.	3h
17.2	Wein Bridge oscillator	
18.1	Hartley Oscillator	3h
18.2	Colpitts Oscillator	
19	Crystal Oscillator	3h
20	Construction and testing of Class B/Class AB push pull amplifiers	3h

Semester – 3 Module Name: Digital Electronics 2 Lab Module code: CP04307P		
Sl. No.	Module Details	Practical Hours 60
1.a	Implement Active-High RS Flip-flop using Logic Gates	3h
1.b	Implement Active-Low S'R' Flip-flop using Logic Gates	
2.a	Implement D Flip-flop using Logic Gates	3h

2.b	Implement JK Flip-flop using Logic Gates	
3	Implement Master Slave JK Flip-flop using Logic Gates	3h
4.a	Familiarize Octal D-Latch IC 74373	3h
4.b	Familiarize Octal D-FF IC 74374	
5.a	Familiarize D-FF IC 7474	3h
5.b	Familiarize JK-FF IC 7476	
6.a	Implement 3-bit Ripple Up using D-FF IC	3h
6.b	Implement 3-bit Ripple Down Counter using D-FF IC	3h
7.a	Design and Implement Mod-6 Ripple Up Counter using D-FF IC	3h
7.b	Design and Implement Decade Ripple Up Counter using D-FF IC	3h
8.a	Familiarize Asynchronous Decade Counter using IC 7490	3h
8.b	Familiarize Asynchronous 4-bit Binary Counter using IC 7493	
9.a	Familiarize Synchronous Decade Counter IC 74160	3h
9.b	Familiarize Synchronous 4-bit Binary Counter IC 74163	
10.	Design a Modulo-4 Irregular Synchronous Counter with the following counting sequence using IC 7474. (Sequence: 0 → 2 → 3 → 1 → 0 → Repeats)	3h
11.a	Design and Implement 3-bit SISO using D-FF IC	3h
11.b	Design and Implement 3-bit PIPO SRG using D-FF IC	
12.	Design a 3-bit Bidirectional Shift Register	3h
13.a	Familiarize 4-bit Shift Register IC 7495 & IC 74195	3h
13.b	Familiarize 4-bit Universal Register IC 74194	3h
14.a	Design and Implement 3-bit Ring Counter using D-FF IC	3h
14.b	Design and Implement 3-bit Johnson Counter using D-FF IC	3h
15	Familiarize DAC IC 0808	3h
16	Familiarize ADC IC 0808	3h

Semester – 3 Module Name: Computer Programming Lab – C, C++ Module code: CP04308P		
Sl. No.	Module Details	Practical Hours 60
1	Introduction to Visual studio 2019. Menu and sub menu. Install and configure. Learn to create a project, empty project, add a c file Write "Hello world" program	1h
2	a. Write a C program to declare suitable variables and initialize values for printing: Name, token number, section, present SGPA, mobile number. b. Modify the above program to read the values through keyboard using scanf().	1h
3	Write a program to print bytes required for short, integer, float, char and double by using sizeof() function.	1h
4	a. Write a program to declare int x, y, float k, m and char chk[10]. Initialize some values. i. Write code to x= x+y; m+= k; k=k+y; printf("%s",chk); ii. Insert toggle break point on x=x+y; iii. Add watch for all variables.	2h
5	i. Declare 3 alphabets and 3 single digits (0 to 9) as char. Printf all of them using %c and also as %d. ii. Swap any of the two alphabets. iii. Declare any two numbers, integer or float, as variables. Swap the numbers.	2h
6	a. Write a program to read (scanf) marks of a Module and display if marks more than or less than 50, using 'if' statement. b. Modify the program to display grade: A if marks>80, B if marks<80 and >70, C if marks<70 and >60, D if marks<60 and >50, E if marks<50. Use 5 if statements. c. Modify program to display grades using nested if else statements.	2h
7	Write a program to calculate square and also square root of any number. Number to be read using scanf. Print the answer using printf. Modify the code using different methods	2h
8	Write a program using while loop to print first 10 numbers of Fibonacci series; modify the program using different methods	2h
9	a. Write a c program using do-while loop, to read integer numbers between 1 and 99; exit from loop for 0 b. Write code inside the loop to count how many numbers lie between 90 to 99, 80 to 89, 70 to 79, 60 to 69, 50 to 59 and 1 to 49 (default) using switch case. c. Other example programs d. Modify the code to use while loop instead of do-while.	2h
10	a. Write a program with infinite while loop. Use ESC (ASCII code of ESC) to exit loop. b. Use switch case for branching. c. Display the number in Binary / Octal / Hexa decimal based on menu option input. Write code using while loop.	2h

11	Write a program to input 6 integers and store them in an array, arrange these numbers in ascending order, Modify the above program to input 6 names, Arrange them in alphabetical order	2h
12	Write a program to input two 3x3 matrix using two-dimensional array. Perform the following operations i. Sum of matrices ii. Determinant of matrices iii. Modify the program to find area of triangle with vertices (0, 1), (2, 5) and (3, -3)	2h
13	a. Declaration of an array as global or local. b. Declare and define a function to calculate and Return (Value/argument) average value of these numbers. c. The function should return the variance. d. Call both the functions from main (). d. Modify the program to call variance function from average function. e. Create another c file. Move the function to calculate the variance to this file. How will you ensure array data is available in this file?	2h
14	a. Write a program to input a sentence (gets). b. Open another c file. Display length of the sentence in that file. c. Copy the first 10 characters to another string. d. Reverse the string and print.	2h
15	a. Write a C Program to input a number and print the factorial of that number. b. Use while loop. Use multiplication in reverse order to find factorial. Modify the program to use recursive function	2h
16	a. Write a function to input a number. b. Write a function doubler(), to double the number and store back in same variable (Pass the variable by value) Modify the program to pass variable by reference	2h
17	a. Declare the variables to store marks of 10 students. b. Declare an array of integer pointers and store the address of the above variables in it. c. Add 5 grace marks to all students using address stored in pointer array. Print the marks using address stored in pointer array.	2h
18	Write a program and define a macro to calculate area of a rectangle and another macro to calculate area of a triangle.	1h
19	Write a C program to implement the concept of enum.	1h
20	a. Exercise programs to open, read, write, delete and remove a file. b. Open this file in Excel and check.	4h
21	a. Write a C Program to create a structure called student, with members name, token number & age and display the details for one student.	4h

	b. Declare an array of pointers to store address for the above structure. c. Modify the code to use typedef for the structure declared.	
22	Modify the above exercise (21). Create a header file and move all the #include statements, data declaration code such as structure and variables into header file. Move the function declaration of function for data input also to the header file.	1h
23	Copy the example code and execute it in Visual studio.	1h
24	Copy the example code and execute it in Visual studio.	1h
25	Write a C++ program by having the class name "Personal Details." Perform the following operations. i. Write two member functions - GetData(); & PutData(); ii. Declare an array of above classes to store details of 3 students. iii. Modify the code to include default constructor and destructor	3h
26	a. Write a program to create a class land. b. Create 3 member functions with name "Area" inside a class and find the area for 1) Square 2) rectangle 3) Circle (Function Overloading) c. Decide what variables are to be declared.	2h
27	a. Create a class called "Complex". The data members of the class are real & imaginary. b. The member functions of the class are void getdata(), Complex ADD(Complex, Complex),Complex SUB(Complex, Complex). c. With these details stated, 1) Add 2 complex numbers 2) Subtract 2 complex numbers. d. Check the class view in Visual Studio 2019 and explore it.	3h
28	a. Write a program with a class Time having Hour and minute as members. b. Write constructor to initialize the members variables. c. Declare two objects of the class. d. Write a function to overload ++ & overload +	4h
29	a. Write a program with a class department having Dept_name, subject, subject_hours as its members. b. Examples for Class inheritance and object class	4h

Semester – 3		Module Name: PCB Design and Fabrication Lab	Module code: CP04309P
Sl. No.	Module Details	Practical Hours 40	
1	Design a PCB layout for the 5V power supply circuit	2h	
2	Design a PCB layout for the given multivibrator circuit.	2h	

3	Design a PCB layout for Water Level Indicator	2h
4	Design a PCB layout for the given multivibrator circuit with SMD.	2h
5	Design the PCB layout for Automatic Street Light Circuit	2h
6	Design a PCB layout for the given tone generator circuit.	2h
7	Design a PCB layout for the given IR sensor circuit	2h
8	Design a PCB layout for the given preamplifier circuit.	2h
9	Design a PCB layout for the clap switch circuit	2h
10	Design the PCB layout for the given cyclic lights circuit.	2h
11	Design a PCB layout for the given Museum watch dog circuit.	2h
12	Design a PCB layout for the given remote control receiver circuit.	2h
13	Design a PCB layout for the given 5 min. Timer circuit.	2h
14	Design a PCB layout for the given 8051 microcontroller development board	2h
15	Design a PCB layout for the given L298 motor driver circuit.	2h
16	Design a PCB layout for the given object counter circuit.	2h
17	Fabricate the single sided PCB for the 5V power supply circuit	4h
18	Fabricate the single sided PCB for Automatic Street Light Circuit	4h

Semester – 3 Module Name: Analog Communication Lab Module code: CP04310P		
Sl. No.	Module Details	Practical Hours 40
1	RC Low Pass Filter.	2h
2	RC High Pass Filter	2h
3	LC Low Pass Filter- T and Pi Model	2h

4	LC High Pass Filter- T and Pi Model	2h
5	LC Band Pass Filter- T and Pi Model	3h
6	LC Band Stop Filter- T and Pi Model	3h
7	Characteristics of Attenuators	3h
8	Series Resonant Circuit	2h
9	Parallel Resonant Circuit	2h
10	Amplitude Modulator & Detector using Diode.	3h
11	Mixer Circuit using BJT	2h
12	DSBSC – AM generator with IC LM 1496 & Detector using Diode	3h
13	AM-DSBFC & DSBSC generator Using IC AD633 and Detector using Diode.	3h
14	FM modulator using IC 566 and Detector using IC 565	2h
15	FM modulator using IC 555 and Detector using IC 565	2h
16	AM Mixer, Modulator and Detector – A project	4h

Semester – 3		Module Name: Simulation Lab	Module code: CP04311P
Sl. No.	Module Details	Practical Hours 40	
1	Micro SIM LT Spice introduction	4h	
2	Ohms laws, Kirchhoff's law	2h	
3	Diode characteristics (input and output characteristics)	2h	
4	Zener diode characteristics and Zener diode as regulator	2h	
5	Rectifiers-Half wave, Full wave, Bridge rectifier	4h	
6	Diode applications-Clipper and Clamper, Peak detector	4h	

7	LED Characteristics	2h
8	LED in Series and Parallel connections	2h
9	Transistor Characteristics	2h
10	Transistor as a switch	2h
11	Summing amplifier	2h
12	Differential amplifier	2h
13	Op amp as integrator	2h
14	Filter circuits using op amp (low pass, high pass, band pass)	4h
15	Phase shift oscillator	4h

Semester – 4 Module Name: Circuit Analysis Module code: CP04401T		
Sl. No.	Module Details	Theory Hours 40
1	Basics Of Circuit Analysis	8h
2	Circuit Analysis of Power Supply	20h
3	Circuit Analysis of Function Generator	8h
4	Phase Locked Loop	2h
5	EMC and EMI	2h

Semester – 4 Module Name: Electronic Instrumentation and Measurement Module code: CP04402T		
Sl. No.	Module Details	Theory Hours 40
1	Introduction	4h
2	Electrical Measuring Instruments	12h
3	Electronic Measuring Instruments	8h
4	Process Measuring Instruments	16h

Semester – 4 Module Name: Microcontroller and Applications Module code: CP04403T		
Sl. No.	Module Details	Theory Hours 60
1	Introduction to Microprocessors and Microcontrollers	6h
2	Study of Memory	4h
3	8051 Architecture	7h
4	Programming of 8051	10h
5	Timers And Interrupts of 8051	9h
6	8051 Application Examples	12h
7	Introduction To 8051 Programming in C	12h

Semester – 4 Module Name: Computer Programming – Python and Data base Module code: CP04404T		
Sl. No.	Module Details	Theory Hours 40
1	Introduction of python	2h
2	Python Data type, Decision Making and Loops	6h
3	Tuples, Dictionaries, and Data Processing	6h
4	Functions and Files	6h
5	Python Object Oriented Programming	5h
6	Database concept	3h
7	SQL	12h

Semester – 4 Module Name: Industrial Electronics Module code: CP04405T		
Sl. No.	Module Details	Theory Hours 60
1	Introduction To Industrial Electronics	2h

2	Introduction to thyristor family	13h
3	Application of thyristor	4h
4	Protection Circuits	2h
5	Phase controlled rectifier	7h
6	Choppers	5h
7	Inverter	7h
8	Cyclo converters	4h
9	Power Supplies	6h
10	Control of DC drives	7h
11	Control of AC drives	3h

Semester - 4		Module Name: Employability Skills	Module code: CP04412T
Sl. No	Module Details		Theory Hours 30
1	Financial and Legal Literacy		8h
2	Occupation safety, Health, and Environment education.		10h
3	Digital Literacy Skills		8h
4	Essential skills for success.		4h

Semester – 4		Module Name: Circuit Analysis Lab	Module code: CP04406P
Sl. No.	Module Details		Practical Hours 50
1	Analysis of the given circuit using Node and mesh analysis		3h
2	Analysis of the given circuit using super position and Thevenin's theorem		3h
3	Transistorized series voltage regulator with simple current limiting		3h

4	Transistorized series voltage regulator with fold back current limiting	3h
5	Over voltage protection -Crowbar	3h
6	Op amp based positive series voltage regulator	3h
7	Op amp based negative series voltage regulator	3h
8	IC regulator- 78XX—regulation, as floating regulator, variable regulator and extension of current	3h
9	IC regulator- a) 79XX—regulation b) Single circuit of Positive & negative regulator	3h
10	IC regulator- LM317--- Regulation, as fixed & variable, variable from 0-37V	3h
11	IC regulator- LM723 a) as Positive & Negative b) as Low voltage regulator with simple current limiting	5h
12	IC regulator- LM723 a) as High voltage regulator with fold back current limiting b) as High current regulator	4h
13	Op amp based dual tracking regulator	3h
14	Triangular wave generator	3h
15	4 diode sine shapers	3h
16	Case study presentation of the given project	4h

Semester – 4 Module Name: Electronic Instrumentation and Measurement Lab Module code: CP04407P		
Sl. No.	Module Details	Practical Hours 40
1	Familiarization with Pulse Generator	3h
2	Performance test on Function Generator	3h
3	Performance test on Cathode Ray Oscilloscope	3h
4	Performance test on Power Supply	3h

5	To find the characteristics of PT – 100	3h
6	To find the characteristic of Thermistor	3h
7	To find the characteristics of Thermocouple	3h
8	Using LM – 35 and AD – 590 as temperature sensor.	3h
9	To find the characteristics of LDR	3h
10	To find the characteristics of Strain Gauge.	3h
11	Using LVDT for measuring the linear displacement with signal conditioning circuit.	3h
12	To find the characteristics of Proximity Sensor – Capacitive type and Inductive type	3h
13	To find the characteristics of Smart Sensors like – IR Sensor, UV Sensor, PIR Sensor and Gas Sensor	4h

Semester – 4 Module Name: Microcontroller and Applications Lab Module code: CP04408P		
Sl. No.	Module Details	Practical Hours 60
1	Familiarization of Keil Compiler	3h
2	Write a program to place the number 8Dh in RAM locations from 30h to 34h	3h
3	Write a program to copy the contents of DPTR to registers R0 (DPL) and R1 (DPH)	
4	Write a program to add two 8-bit numbers and store the result in RAM location 35h	3h
5	Write a program to subtract the contents of RAM location 13h from the Ram location 2Bh put the result in RAM location 2Ch	
6	Write a program to add two 16-bit numbers without carry and store the result in 30h(LSB) and 31h(MSB)	3h
7	Write a program to exchange the contents of B register and RAM address 30h	
8	Write a program to swap the bytes in timer 0.put TL0in TH0 and TH0 inTL0	
9	Write a program to Double the number in register R2, and put the result in register in R3 (high byte) and R4 (low byte)	2h

10	Write a program to add the unsigned numbers found in internal RAM locations 25h, 26h and 27h together and put the result in RAM locations 31h (MSB) and 30h (LSB)	2h
11	Write a program to multiply unsigned numbers in register R3 by the number in register in R4 and put the result in external RAM locations 10h (MSB) and 11h (LSB).	2h
12	Write a program to divide the data in RAM location 3Eh by the number 12h, put the quotient in R4 and the remainder in R5	2h
13	Write a program to place any number in the internal RAM location 3Ch and increment it until the number equal 2Ah	2h
14	Write a program to move a block of data from memory X to Y.	2h
15	Write a program to find the factorial of the number stored in the internal RAM locations 30h.	2h
16	LED and Switch Interfacing and display the status in LED	2h
17	Alpha numeric LCD interface	3h
18	DC Motor Interfacing	3h
19	Stepper Motor Interfacing	3h
20	Waveform generation: - a) Square Wave b) Rectangular Wave	3h
21	4x4 Matrix Keypad Interfacing	3h
22	Interfacing of ADC	3h
23	LED and Switch Interfacing and display the status in LED	2h
24	Alpha numeric LCD interface	2h
25	DC Motor Interfacing	2h
26	Stepper Motor Interfacing	2h
27	Waveform generation a) Square Wave b) Rectangular Wave	2h
28	4x4 Matrix Keypad Interfacing	2h
29	Interfacing of ADC	2h

Semester – 4 Module Name: Computer Programming-Python and Data Base Lab Module code: CP04409P		
Sl. No.	Module Details	Practical Hours 30
1	Python Program to Add Two Numbers	3h
2	Python Program to Solve Quadratic Equation	

3	Python Program to Swap Two Variables	3h
4	Python Program to Check if a Number is Positive, Negative or 0	
5	Python Program to Find the Largest Among Three Numbers	
6	Python Program to Check Prime Number	
7	Python Program to Find the Factorial of a Number	
8	Python Program to Print the Fibonacci sequence	3h
9	Python Program to Find Armstrong Number in an Interval	
10	Python Program to Find the Sum of Natural Numbers	
11	Python Program to Display Powers of 2 Using Anonymous Function	
12	Python Program to Find Numbers Divisible by Another Number	3h
13	Python Program to Convert Decimal to Binary, Octal and Hexadecimal	
14	Python Program to Find HCF or GCD	
15	Python Program to Find LCM	
16	Python Program to Make a Simple Calculator using elif statement	3h
18	Python Program to Display Fibonacci Sequence Using Recursion	
20	Python Program to demo on class.	
21	Python Program to demo on Inheritance.	
22	Python Program to demo on Data Encapsulation	3h
23	Python Program to demo on Polymorphism	
24	Python Program to Add Two Matrices	
26	Python Program to Multiply Two Matrices	
27	Python Program to Check Whether a String is Palindrome or Not	

28	Python Program to Remove Punctuations from a String	3h
29	Python Program to Sort Words in Alphabetic Order	
30	Python Program to Illustrate Different Set Operations	
31	Python Program to Count the Number of Each Vowel	
32	Python Program to Merge Mails	1.5h
Database- PostgreSQL		
33	Demo on database - Creating Databases	3h
34	Demo on database - Viewing a Database	
35	Demo on database - Deleting Database	
36	Demo on Creating Tables	
37	Demo on Creating tables with constraints	3h
38	Demo on Data Manipulation Language with different types Inserting values	
39	Demo on Data Manipulation Language with different types updating values	
40	Demo on Data Manipulation Language with different types Deleting Rows	
41	Demo on Deleting a Table	1.5h
42	Demo on Truncating a Table	
43	Writing a basic select statement	
44	Writing a basic select statement using where clause	
45	Writing a basic select statement to perform on joins	1.5h
46	Writing a basic select statement to perform on Sub queries	
47	Demo on to create view for the table	

Semester – 4 Module Name: Industrial Electronics Lab Module code: CP04410P		
Sl. No.	Module Details	Practical Hours 50
1	Familiarization of Digital Storage Oscilloscope and Function Generator	1h
2	Design and winding of an inductor	2h
3	To analyse the magnetization and de-magnetization current of inductors.	3h

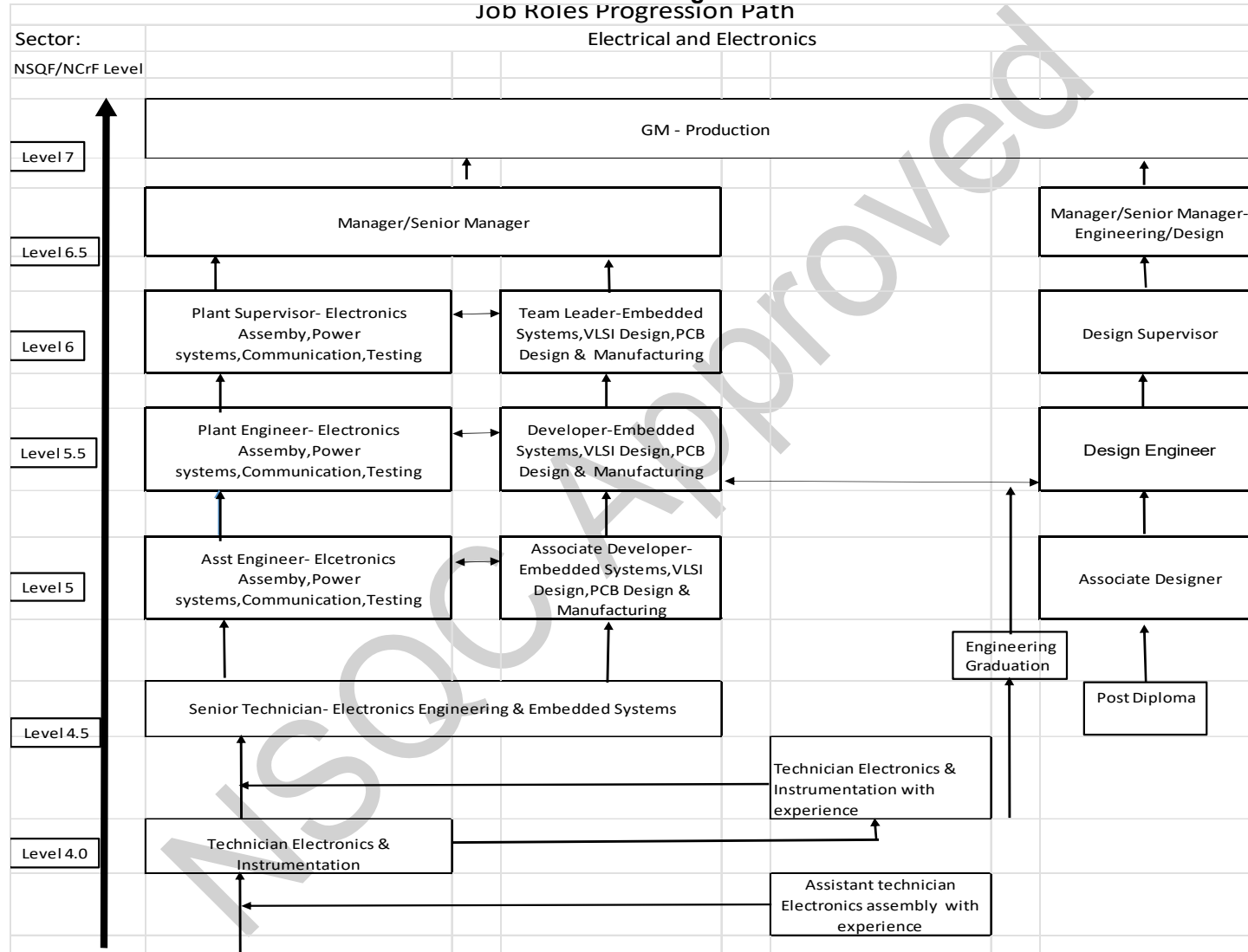
4a	VI characteristics of SCR	4h
4b	VI characteristics of TRIAC	
5	Switching characteristics of IGBT.	3h
6	Reverse Recovery of Diode.	3h
7	Resistance and RC triggered circuits of SCRs.	3h
8	UJT as a relaxation oscillator and SCR firing circuits using UJT.	3h
9	Single phase half converter with resistive load	3h
10	Single phase full converter with resistive load	3h
11	Characteristics of buck converter	4h
12	Characteristics of boost converter	4h
13	Chopper fed DC Motor driver	4h
14	Series and parallel inverters.	4h
15	PWM signals Generator	4h
16	Speed control of DC drives	2h
17	Speed control of AC drives	2h

Semester – 4		Module Name: IoT -1 Lab	Module code: CP04411P
Sl. No.	Module Details	Practical Hours 40	
1	Arduino	2h	
2	Software Arduino	2h	
3	Programming in Arduino	3h	
4	Interfacing with Arduino	5h	
5	Introduction to IoT	2h	

6	Architecture of IoT	2h
7	Clouding computing	3h
8	Advanced mc {NODE MCU}	3h
9	App creation	2h
10	Thingspeak introduction	2h
11	Interfacing with NODEMCU	8h
12	Control the interface through mobile app using NODE MCU	3h
13	Mini project	3h

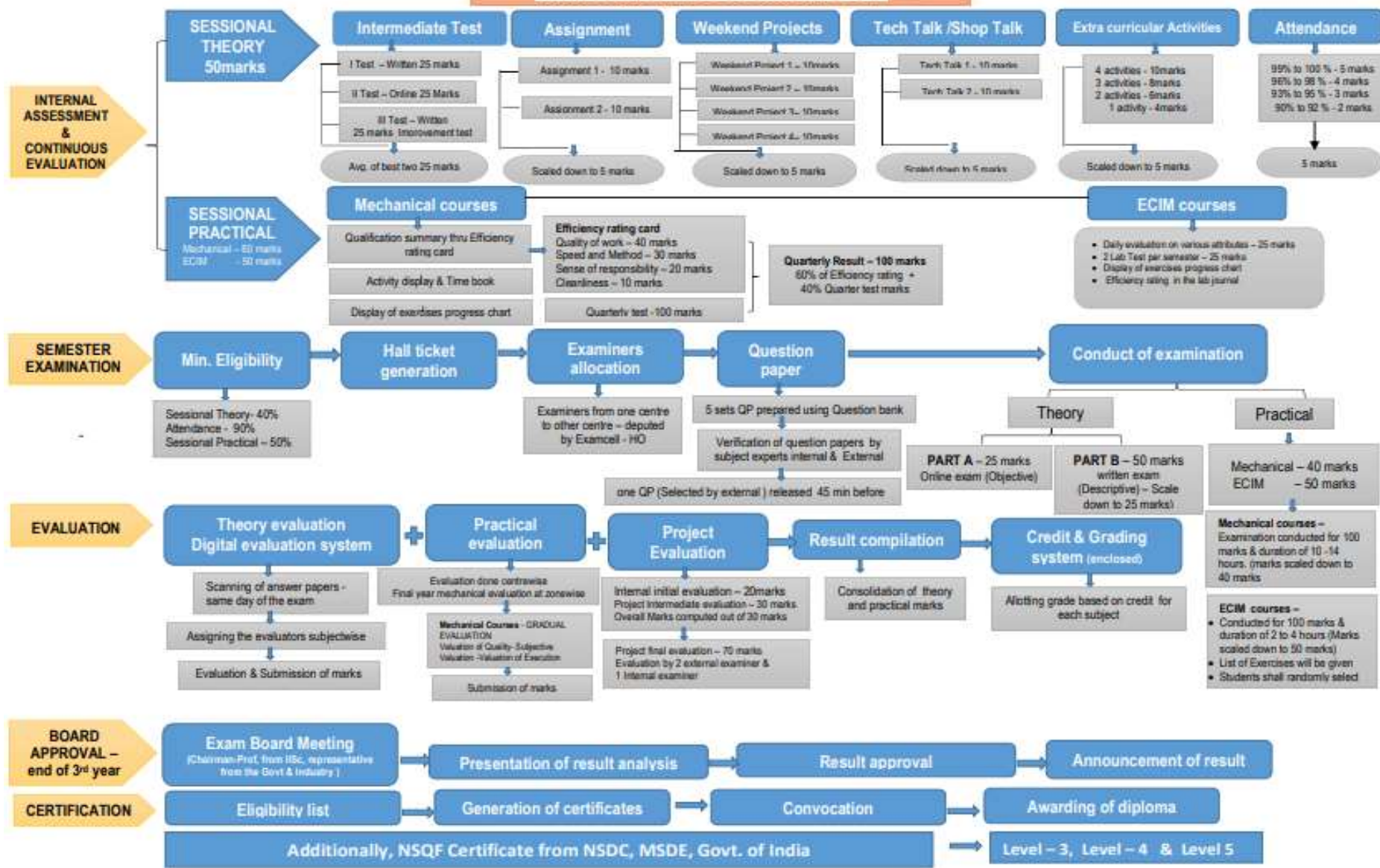
Semester - 4		Module Name: OJT	Module code: CP04413P
Sl. No	Module Details	Practical Hours 90	
1	OJT- On the Job Training in the Industry	90h	

Annexure 9: Career Progression Job Roles Progression Path



Annexure: 10 Assessment SOP

Annexure: Assessment SOP



Annexure 11: Occupational Map
Occupational Map - Sector Name: Electrical & Electronics

As per NCrF		As per NCO-2015	Sub-Sector 1/Automotive, Aerospace, Home appliances, Textile, Construction machinery	
NCrF Level (1-8)	Level Descriptors	NCO-15 -- Family (First 4 digits code/s for the given level crosscutting the OM Sub-Sectors/Occupations)	Occupation 1/Electronics System design and Manufacturing	Occupation 2/VLSI & Embedded System Design and Development
Level 8	1. Professional Theoretical Knowledge: Mastery of knowledge / Innovation driven/ Comprehensive knowledge 2. Professional and Technical Skills/ Expertise: Most advanced Technical and Managerial skills 3. Employment Readiness & Entrepreneurship Skills & Mind-set: Significant authority, transformational leadership, Social intelligence 4. Broad Learning Outcomes: Lead large transformational projects 5. Responsibility: Business Vision Chairperson/ Board Member / CMD	1120	Managing Director	Managing Director
Level 7	1. Professional Theoretical Knowledge: Advanced knowledge with critical understanding of emerging developments 2. Professional and Technical Skills/ Expertise: Highly specialized skills, transdisciplinary skills, leadership skills 3. Employment Readiness & Entrepreneurship Skills & Mind-set: Cross cultural competency, transformational leadership 4. Broad Learning Outcomes: Apply acquired advanced technical skills, technical appraisal and reviews 5. Responsibility: Business Management (like GM/ CEO / CXO, etc.)	1321 2151	GM -Production/ System Development/ Entrepreneur	GM -Production/ System Development/ Entrepreneur
Level 6.5	1. Professional Theoretical Knowledge: Advanced multidisciplinary and specialized knowledge 2. Professional and Technical Skills/ Expertise: Advanced Technical and Managerial Skills	1223 2151	Manager/Senior Manager-Electronics Assembly, Power	Manager/Senior Manager-Engineering Design

	3. Employment Readiness & Entrepreneurship Skills & Mind-set: Leadership, effective resource management 4. Broad Learning Outcomes: Judgement in complex problems 5. Responsibility: Vertical/ Business unit management –Manager or Senior Manager		Systems, communication, testing, Development Manager - Embedded Systems, VLSI Design, PCB Design & Manufacturing.)	
Level 6	1. Professional Theoretical Knowledge: Multidisciplinary and specialized knowledge 2. Professional and Technical Skills/ Expertise: Range of skills along with specialized domain skills 3. Employment Readiness & Entrepreneurship Skills & Mind-set: Entrepreneurial mindset, selfmanagement 4. Broad Learning Outcomes: Judgement / decision making – specialized 5. Responsibility: Team leader – Junior technical supervisor, Technical supervisor or junior/ deputy manager	1223 2151 2152	Plant Supervisor - Electronics Assembly, Power Systems, communication, testing, Team Leader Development - Embedded Systems, VLSI Design, PCB Design & Manufacturing.	Design Supervisor
Level 5.5	1. Professional Theoretical Knowledge: Specialized knowledge 2. Professional and Technical Skills/ Expertise: Specialized skills 3. Employment Readiness & Entrepreneurship Skills & Mind-set: Team readiness, self-entrepreneurship readiness 4. Broad Learning Outcomes: Specialized/ complex jobs/tasks 5. Responsibility: Self and team responsibility – Sr. Technician or Master Technician	2152 3114 3122	Plant Engineer - Electronics Assembly, Power Systems, communication, testing, Developer - Embedded Systems, VLSI Design, PCB Design & Manufacturing.	Design Engineer
Level 5		2152 3114 3122 2512	Assistant Engineer - Electronics Assembly, Power Systems, communication, testing, Associate Developer - Embedded Systems, VLSI Design, PCB Design & Manufacturing.	Associate Designer

Level 4.5	1. Professional Theoretical Knowledge: Range of knowledge 2. Professional and Technical Skills/ Expertise: Range of technical skills 3. Employment Readiness & Entrepreneurship Skills & Mind-set: Team readiness & Enterpreurial readiness 4. Broad Learning Outcomes: Carry out Range of tasks and may provide range of solutions 5. Responsibility: Accountable/ responsible - Jr. Technician & Technician	2152 3114 3122 2512	Senior Technician- Electronics Engineering & Embedded Systems, Circuit Analyst, System validator	Study Post Diploma, System validator, Embedded programmer and tester
Level 4.0	1. Professional Theoretical Knowledge: Range of knowledge 2. Professional and Technical Skills/ Expertise: Range of technical skills 3. Employment Readiness & Entrepreneurship Skills & Mind-set: Team member/follows instructions 4. Broad Learning Outcomes: Carry out Range of tasks with minimum supervision 5. Responsibility: Accountable/ responsible - Jr. Technician & Technician	3114 7311	Technician Electronics & Instrumentation, PCB and circuit tester, Sensor testing and calibration Testing and Developing	Embedded programmer, Embedded system tester, Maintenance of embedded systems

Annexure 12: Key Learning Outcome

SL NO	MODULE NAME	KNOWLEDGE AND UNDERSTANDING	TECHNICAL & PROFESSIONAL SKILLS	APPLICATION OF KNOWLEDGE AND SKILLS
SECOND YEAR				
1	Analog Electronics – 2 (CP04301T) Analog Electronics – 2 Lab (CP04306P) Design and analyse various electronic circuits.	Understand power amplifiers and their characteristics and frequency response. Explain the Characteristics of Op-amp, symbol and applications- Differential amplifier, Comparator, Adder, Subtractor, Instrumentation amplifier etc.	Perform the AC & DC analysis of amplifiers. Construction, working and applications of Differential amplifier (inverting & non-inverting), Design and implementation of various Oscillators Design Op-amp based circuits	Select the component as per the requirement & read and comprehend the datasheet. Heat sink consideration and knowledge on selection and fixing the heat sink. Analysis of the electronic circuits
2	Digital Electronics – 2 (CP04302T) Digital Electronics – 2 Lab (CP04307P) Design and Analysis of the Digital circuits	Differentiate Latches and Flip- flops. To understand various display devices and their applications. Knowledge on PLA and PAL Explain CPLD and FPGA Describe the types of Memories	Construct and verify different Digital Logic Circuits [Flip flops and counters] Design of synchronous and asynchronous counters Analyse, design and implement sequential logic circuits. Analyse, design and implement data converter circuits and different memories.	Select the components as per the specification and interpret the datasheet. Able to analyse and rectify any sequential/ combinational circuits.
3	Computer Programming- C, C++ (CP04303T) Computer Programming- C, C++ Lab (CP04308P) Computer Programming – Python and Data Base	Describe how C++ improves C with object-oriented features. Define and use the syntax and semantics of the C, C++ programming language.	Write inline functions for efficiency and performance. Implement copy constructors and class member functions.	Apply the concept of data abstraction and encapsulation to ensure that the data is not corrupted due to malfunctioning of any sub-system.

	(CP04404T) Computer Programming – Python and Data Base (CP04409P) Ability to Create C and C++ programs for engineering applications.	Explain the concept of data abstraction and encapsulation. Understand the Basics of Python Programming Understand the Database Concepts Explain the basic concepts of DBMS. Write query on Data base, Table and PL SQL and analyse the data. Explain the Network and Internet terminologies and Design Web page using HTML, CSS and Java script.	Execute overload functions and operators in C, C++ Perform inheritance and virtual functions implement dynamic binding with polymorphism. Perform design and implement generic classes with C, C++ Implement exception handling in C, C++ and SQL programs and ensure that the system is not corrupted, and all the faults and errors are trapped. Write programs on python with right syntax and semantics, debug the program	Apply the concepts of Class, Inheritance, Data Encapsulation and polymorphism using python. Develop an Android apps using Java script. Design the database with planning and coding
4	PCB Design & Fabrication (CP04304T) PCB Design & Fabrication Lab (CP04309P) Ability to Design and fabricate PCB for simple electronic circuits.	Describe the steps involved in schematic, layout, fabrication and assembly process of PCB design.	Design (schematic and layout) PCB for analog circuits, digital circuits and mixed circuits. Design (schematic and layout) and fabricate PCB for simple circuits.	Customize the PCB board as per the requirement.
5	Analog Communication (CP04305T) Analog Communication Lab (CP04310P) Understanding of different communication components and techniques.	Explain different types of signal transmission and modulation techniques. Explain about the working of RADAR Communication, Satellite communication, Sonar, Drones and OFC.	Design and implement different filters, Resonant circuits, Attenuators & Equalizers and draw their characteristics and applications.	Selection of the components and analysis of the Communication circuit for various frequency spectrum

6	Circuit Analysis (CP04401T) Circuit Analysis Lab (CP04406P) Analyzing of various AC and DC circuits and its applications.	Knowledge on different protection circuits Understand PLL and its applications. Understanding on EMI & EMC protection	Analysis of R, C, L and their combinations, various electronic circuits using electrical network theorems. Design various combinations dc regulated power supplies.	Design and rectification of dc power supply Able to analyse and trouble shoot analog, digital and mixed circuits
7	Electronic Instrumentation & Measurement (CP04402T) Electronic Instrumentation & Measurement Lab (CP04407P) Understanding the properties, working principle and applications of different sensors and transducers.	Construction, block diagram and working of electronic measuring instruments. Identify, describe and implement various sensors and transducers in process control circuits	Find the characteristics and applications of Thermistor, Thermocouple, LM 35, LDR Performance test on measuring instruments	Determine the specification and characteristics of different measuring instruments.

8	Microcontroller & Applications (CP04403T) Microcontroller & Applications Lab (CP04408P) Understanding the Architecture of 8051 Microcontrollers, their programming and interfacing with peripheral devices.	Understand the Architecture of 8051 Microcontroller Write Basic Assembly language & C Programming.	Use 8051microcontroller, connect 8 LED to the port, and blink the LED with a switch. Perform the use of an ADC and DAC to read input voltage and provide output voltage. Perform the use of RS232 and USB interface with Computer interface. Demonstrate entering of simple programs, execute & monitor the results. Interface peripherals to 8051 Microcontroller. (Peripherals: Keyboard, LEDs, SSD, LCD display, relay and motor, drivers, keypad,)	Apply different protocols like I2C and SPI in various applications. Develop the hardware and firmware for embedded projects
9	Industrial Electronics (CP04405T) Industrial Electronics Lab (CP04410P) Understanding of construction, characteristics and applications of power devices.	Distinguish between power electronics and low power electronics. Knowledge on construction, Operation, Characteristics of power Devices, triggering and commutation (GTO, IGBT, SBS etc) Will be able to explain various protection circuits associated with power circuits (over voltage protection, snubber circuit)	Will be able to draw and explain power rectifiers (controlled and uncontrolled), Inverters (single phase/three phase, PWM), Choppers (cyclo) Will be able to design linear power supplies, switch mode power supplies, Uninterruptible Power Supplies and their applications. Will be able to design and develop various ac and dc drives, speed control in braking systems	Follow all the prescribed safety norms of the Lab. Able to analyse and rectify any Power electronics circuits.

10	Simulation Lab (CP04311P) Ability to draw and simulate electronic circuits using LT Spice software.	Create Electronic Circuit in simulation platform using LT Spice, test and diagnose for desired output. Check the output response for various input signals	Measure voltage/ current at different test points Detect fault observing diagnostic procedure and rectify using simulation software. Rectify by resetting errors using simulation software	Rectification of errors using simulation software Assemble and test Electronic Circuit on simulation software, Measure voltage/ current at different test points
11	IoT -1 Lab (CP04411P) Understanding IoT architecture, cloud computing and their applications.	Basic knowledge on IoT architecture and cloud computing and their applications Awareness of various communication protocols, develop and Implement different IoT applications using IoT sensors	Design and implement cloud-based applications. Interface LED, Switch, DC Motor and servo motor with NODE MCU and Arduino	Develop applications using to control various devices using NODE MCU and Arduino processor. Data acquisition using thing speak.
12	Employability Skills (CP04312T) (CP04412T) Understand Entrepreneurship skills Ability to understand financial and legal aspects Understand Occupation safety, Health, and Environment related issues. Ability to use Essential skills.	Knowledge on various schemes and institutions promoting Entrepreneurs. Ways of setting enterprise, legal compliances, marketing, and budgeting etc. Knowledge and understanding on personal finance management, investments, returns, basics of taxes, awareness on financial frauds and prevention. Awareness on fundamental rights under the constitution and facilities available for recourse in the event of breach. Knowledge on Occupation safety and health, at workplace, Occupation Hazards, Accident prevention and PPEs,	Explain the schemes promoted by various support institutions. Budgeting and evaluations. Explain the Occupations hazards and process of mitigation of such hazards. PPEs. Explain environment conservation, and other factors affecting them.	Apply and impart details to other people in the society. Decide, plan and implement various financial management ideas, taxations and benefits and legal compliance in the workplace. Enforce caution against financial frauds and addressal of frauds. Follow all safety norms laid by the industry to develop a safe workplace. Practice stress management techniques to ensure high productivity in the work area.

		Environment, Pollution and protection of environment, Energy conservation, Global warming, Conservation of natural resources, waste management and disposal, Disaster Management. Understanding balancing Life and Career, Value based decision making, Types of stress and stress management.		
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NSQC Approved

Annexure: Acronym and Glossary**Acronym**

Acronym	Description
AA	Assessment Agency
AB	Awarding Body
ISCO	International Standard Classification of Occupations
NCO	National Classification of Occupations
NCrF	National Credit Framework
NOS	National Occupational Standard(s)
NQR	National Qualification Register
NSQF	National Skills Qualifications Framework
OJT	On the Job Training

Glossary

Term	Description
National Occupational Standards (NOS)	NOS define the measurable performance outcomes required from an individual engaged in a particular task. They list down what an individual performing that task should know and also do.
Qualification	A formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards
Qualification File	A Qualification File is a template designed to capture necessary information of a Qualification from the perspective of NSQF compliance. The Qualification File will be normally submitted by the awarding body for the qualification.
Sector	A grouping of professional activities on the basis of their main economic function, product, service or technology.
Long Term Training	Long-term skilling means any vocational training program undertaken for a year and above. https://ncvet.gov.in/sites/default/files/NCVET.pdf