



QUALIFICATION FILE

TECHNICIAN - IT SUPPORT

- ☐ 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- IT Support	
2.	Sector/s	IT- ITeS	
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- IT Support
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-IT-01984-2024-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	Implement various data structure concepts stack, queue, linked list and trees. Use operating system administration, System programming. Design and develop different software applications. Implement the principles of computer networking, including protocols and network architectures. Apply the basic software engineering methods and practices and develop different types of application. The subjects covered in this Programme are – Data Structures with C, OOPS with C++, Computer Networks, Microprocessor and Microcontroller, Operating Systems, OOPS with C++ Lab, Data Structures with C Lab, Computer Networks Lab, Microprocessor and Microcontroller Lab, Employability Skill, Software Engineering, Java Programming, Windows Server Administration and Linux Server Administration, IoT, Web programming (Java Script, Perl, PHP, Python), Web programming (Java Script, Perl, PHP, Python) Lab, Java Programming Lab, Windows Server Administration and Linux Server Administration Lab, IoT Lab, OJT	

9.	Eligibility Criteria for Entry for Student/Trainee/Learner/Employee	a. Entry Qualification & Relevant Experience: <table border="1" data-bbox="915 272 2013 716"> <thead> <tr> <th data-bbox="915 272 999 370">Sl. No.</th> <th data-bbox="999 272 1738 370">Academic/Skill Qualification (With Specialization - if applicable)</th> <th data-bbox="1738 272 2013 370">Required Experience (with Specialization)</th> </tr> </thead> <tbody> <tr> <td data-bbox="915 370 999 716">1</td> <td data-bbox="999 370 1738 716"> 12th Pass with Mathematics OR 10th + 2 years ITI in the following trades: Information and Communication Technology, System Maintenance, Information Technology OR 10th + 2 years diploma /pursuing 3rd year of diploma in relevant trade. OR Certificate -Assistant Technician IT Installation Level 3.5 from NTTF </td> <td data-bbox="1738 370 2013 716">NA</td> </tr> </tbody> </table>						Sl. No.	Academic/Skill Qualification (With Specialization - if applicable)	Required Experience (with Specialization)	1	12 th Pass with Mathematics OR 10 th + 2 years ITI in the following trades: Information and Communication Technology, System Maintenance, Information Technology OR 10 th + 2 years diploma /pursuing 3 rd year of diploma in relevant trade. OR Certificate -Assistant Technician IT Installation Level 3.5 from NTTF	NA												
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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 <table border="1" data-bbox="915 911 2013 1138"> <thead> <tr> <th data-bbox="915 911 1192 1036">Training Delivery Modes</th> <th data-bbox="1192 911 1346 1036">Theory (Hours)</th> <th data-bbox="1346 911 1499 1036">Practical (Hours)</th> <th data-bbox="1499 911 1671 1036">OJT / Project Mandatory (Hours)</th> <th data-bbox="1671 911 1877 1036">OJT Recommended (Hours)</th> <th data-bbox="1877 911 2013 1036">Total (Hours)</th> </tr> </thead> <tbody> <tr> <td data-bbox="915 1036 1192 1089">Classroom (offline)</td> <td data-bbox="1192 1036 1346 1089">520</td> <td data-bbox="1346 1036 1499 1089">470</td> <td data-bbox="1499 1036 1671 1089">90</td> <td data-bbox="1671 1036 1877 1089">-</td> <td data-bbox="1877 1036 2013 1089">1080</td> </tr> <tr> <td data-bbox="915 1089 1192 1138">Online</td> <td data-bbox="1192 1089 1346 1138">120</td> <td data-bbox="1346 1089 1499 1138">-</td> <td data-bbox="1499 1089 1671 1138">-</td> <td data-bbox="1671 1089 1877 1138">-</td> <td data-bbox="1877 1089 2013 1138">120</td> </tr> </tbody> </table> (Refer Blended Learning Annexure for details)						Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT / Project Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)	Classroom (offline)	520	470	90	-	1080	Online	120	-	-	-	120
Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT / Project Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)																				
Classroom (offline)	520	470	90	-	1080																				
Online	120	-	-	-	120																				
14.	Aligned to NCO/ISCO Code/s (if no code is available mention the same)	NCO Code – 2015/3512.9900																							
15.	Progression path after attaining the qualification (Please show Professional and Academic progression)	Professional Progression: After completion of 1 year, can work as Technician IT support. Technician computer hardware.																							

		After Completion of 3 years of Full Time Programme and after 3 years of Industry Experience the Job Holder can work as Software Engineer, Desktop Support Engineer, Test Engineer, Academic Progression: Diploma - Computer Engineering and IT Infrastructure, Post Diploma, B VoC and B.Tech Degree Course in Relevant Areas.	
16.	Other Indian languages in which the Qualification & Model Curriculum 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 are reserved for Women Candidates)	
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 (In case of CS or MS, provide details of both Lead AB & Supporting ABs)	Name: Mr. R Rajagopalan Position in the Organization: Joint Managing Director Email: rg@nttf.co.in Tel number: 080 – 28390215 Contact No.: 9844013448 Website: nttftrg.com	
23.	Final Approval Date by NSQC: 31 Jan 2024	24. Validity Duration: 3 years	25. Next Review Date: 01 Feb 2027

Section 2: Module Summary

NOS/s of Qualifications (In exceptional cases these could be described as components)

Mandatory Module / NOS/s: Specify the training duration and assessment criteria at NOS/ Module level. For further details refer curriculum document.

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	Credits 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	Data Structures with C	CP08306T,V1.0	Core	4.0	19	60	-	-	-	60	100	-	-	-	100	
2	Object Oriented Programming with C++	CP08307T,V1.0	Core	4.0		60	-	-	-	60	100	-	-	-	100	
3	Setting and Configuring Computer Networks-II	CP08308T,V1.0	Core	4.0		60	-	-	-	60	100	-	-	-	100	
4	Microprocessor and Microcontroller	CP08309T,V1.0	Core	4.0		60	-	-	-	60	100	-	-	-	100	
5	Installation and Configuring Operating Systems	CP08310T,V1.0	Core	4.0		60	-	-	-	60	100	-	-	-	100	
6	OOPS with C++ Lab	CP08311P,V1.0	Core	4.0		-	60	-	-	60	-	80	-	20	100	
7	Data Structures with C Lab	CP08312P,V1.0	Core	4.0		-	60	-	-	60	-	80	-	20	100	
8	Setting and Configuring Computer Networks-II Lab	CP08313P,V1.0	Core	4.0		-	60	-	-	60	-	80	-	20	100	
9	Microprocessor and Microcontroller Lab	CP08314P,V1.0	Core	4.0		-	60	-	-	60	-	80	-	20	100	
10	Employability Skill	CP08315T,V1.0	Core	4.0		30	-	-	-	30	75	-	-	25	100	
Duration (in Hours)/ Total Marks					19	330	240			570	575	320		105	1000	
Semester – 4																
11	Software Engineering	CP08406T,V1.0	Core	4.0		40	-	-	-	40	100	-	-	-	100	
12	Java Programming	CP08407T,V1.0	Core	4.0		60	-	-	-	60	100	-	-	-	100	
13	Windows Server Administration and Linux Server Administration	CP08408T,V1.0	Core	4.0		60	-	-	-	60	100	-	-	-	100	

14	IoT	CP08409T,V1.0	Core	4.0	21	60	-	-	-	60	100	-	-	-	100	
15	Web programming (Java Script, Perl, PHP, Python)	CP08410T,V1.0	Core	4.0		60	-	-	-	60	100	-	-	-	100	
16	Web programming (Java Script, Perl, PHP, Python) Lab	CP08411P ,V1.0	Core	4.0		-	60	-	-	60	-	80	-	20	100	
17	Windows Server Administration and Linux Server Administration Lab	CP08412P ,V1.0	Core	4.0		-	60	-	-	60	-	80	-	20	100	
18	Java Programming Lab	CP08413P ,V1.0	Core	4.0		-	60	-	-	60	-	80	-	20	100	
19	IoT Lab	CP08414P,V1.0	Core	4.0		-	50	-	-	50	-	80	-	20	100	
20	Employability Skill	CP08415T,V1.0	Core	4.0		30				30	75	-	-	25	100	
21	OJT	CP08416P,V1.0	Core	4.0		-	-	90	-	90	-	75	-	25	100	
Duration (in Hours)/ Total Marks						21	310	230	90	-	630	575	395		130	1100
Total					40	640	470	90	-	1200	1150	715		235	2100	

Elective Modules/ NOS/s: NA

Sl. 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

Sl. 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 the assessment.)

To pass the Qualification, the trainee should score Minimum 40% in each Theory module, 50% in each Practical module 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 as 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 or 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 Upskilling 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 as 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 Computer Hardware and IT areas. 1. MSDE/ NSDC Report on Human Resources and Skill Requirements in the IT and ITes Sector (2013- 2017, 2017 – 2022) 2. Annual Report 2021-22 of Ministry of Electronics and Information Technology The above Reports predict Higher growth in IT Sector which call for large number of Hardware and Networking Technicians.
2.	Latest Market Research Reports or any other source (not older than 2 years) (Yes/No): Report by India Brand EQUITY Foundation on Indian IT and BPM Industry-2022 The Report Forecast a higher growth in demand for Skilled Man power with Computer and IT skills.
3.	Government /Industry initiatives/ requirement (Yes/No): YES Study on Job Role of the Future by Indian Institute of Skills. 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: 38
5.	Estimated nos. of persons to be trained and employed: 500/ 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 (Mandatory)	Yes
2.	Annexure 2: List of tools and equipment relevant for qualification (Mandatory, except in case of online course)	Yes
3.	Annexure 3: Industry Validations Summary	Yes
4.	Annexure 4: Training & Employment Details	Yes
5.	Annexure 5: Blended Learning (Mandatory, in case selected Mode of delivery is “Blended Learning”)	Yes
6.	Annexure 6: Detailed Assessment Criteria (Mandatory)	Yes
7.	Annexure 7: Assessment Strategy (Mandatory)	Yes
8.	Annexure 13: Multiple Entry-Exit Details (Mandatory, in case qualification has multiple Entry-Exit)	No
9.	Annexure: Acronym and Glossary (Optional)	Yes
10.	Supporting Document: Model Curriculum (Mandatory – Public view)	Digital content available to trainees through Edusquares ERP (Will be made public after the qualification is approved) (Annexure 8)
11.	Supporting Document: Career Progression (Mandatory - Public view)	Yes (Annexure 9)
12.	Supporting Document: Occupational Map (Mandatory)	Yes (Annexure 11)
13.	Supporting Document: Assessment SOP (Mandatory)	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
Advance Certificate - IT Support Technician**

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 how arrays, records, linked structures, stacks, queues, trees and graphs are represented. Explain of OOPs concepts. Create secure LAN and Wireless LAN. Explain NAT concept and network automation. Explain the architecture of different Microcontrollers, their programming and interfacing with Peripheral devices. Explain the concepts of different operating systems. Explain Software Development Life Cycle. Explain Java concepts, Packages and Interfaces. Understand Server Administration and System Administration for Windows as well as Linux. Understanding IoT Architecture, Cloud computing and their applications. Web development using different scripting languages.	Implement various data structure concepts stack, queue, linked list and trees. Apply OOPs concepts for develop new programming languages, Software Development, Web development. Configure secure LAN and Wireless LAN. Implement NAT concept for IP address translation Perform assembly language programs for arithmetic, logical operations using 8085 simulator User interface, Memory management, File management, Process Scheduling. Design and Develop different software applications. Implement java program by using OOP's Concepts. Implement Active Directory, Permissions, Domain name System Identify the different Roles in Linux Server. Build an application with Intel IoT kit. Perform different JavaScript programs.	4.0

Professional and Technical Skills/ Expertise/ Professional Knowledge	Implement various data structure concepts stack, queue, linked list and trees. Apply OOPs concepts in C++ programming. Configure static and dynamic (OSPF) routing. Implement access control list to secure the network. Recall C program and write C program for applications/interfacing modules using 8051 microcontroller. Device management, Security, Networking. Relate the software architectural styles, techniques, models to suitable applications. Create and deploy packages and Interfaces. Install and configure different Server Roles in Windows Server 2012R2 and Linux Server. Explain basics of Arduino boards, understanding interfacing of various types of Sensors with Arduino for real time applications. Implement Django web framework features.	Use stack for back tracking and systematic memory management. Develop application in C++ using OOPs concept. Enables the communication between End points Guaranteed message delivery. Apply knowledge and programming proficiency using the various addressing modes, interrupts and data transfer instructions of the target microprocessor and microcontroller to the maximum optimization level. Use operating system administration, System programming. Apply the basic software engineering methods and practices and develop different types of application. Use Java concepts to develop Mobile Applications Work as a Server Administrator and System Administrator in Industry. Develop real time IoT based project using Intel up square board. Develop Content Management system, Data Analytics, APIs using Django web framework	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 and Legal literacy.	Propagate inclusiveness and team working. Propagate Personal development and team building. Developing creativity and reasoning, making decisions in dynamically challenging situations. Good understanding of various statutory and legal	4.0

	Specify Occupational Safety, Health, and Environment education.	benefits and requirements of an employee. Knowledge of Occupational safety hazards and methods to mitigate them.	
Broad Learning Outcomes/Core Skill	Networking Concepts. Software Development Lifecycle. Web Development.	Implement the principles of computer networking, including protocols and network architectures. Develop software application. Design and build websites using various scripting Languages.	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 equipment	Work effectively in any component assembly. Assist Maintenance activity in industry. Can work independently. Able to assemble, install, test and calibrate Equipment and products in relevant field	4.0

Annexure 2: Tools and Equipment (Lab Set-Up)**List of Tools and Equipment: Batch Size: 30****MICROPROCESSOR, MICROCONTROLLER AND IoT LAB EQUIPMENT**

Sl. No.	Tool / Equipment Name	Specification	Quantity
1	Arduino kit		8
2	NODEMCU/ESP		8
3	Raspberry pi		8
4	Assorted Sensors	-	-
5	Workbench	To be Fabricated	3

SOFTWARE REQUIREMENT

Sl. No.	Tool / Equipment Name	Specification
1	Turbo C++ 3.7.8.9	Open source
2	CISCO Packet Tracer 8.1	Open source
3	Keil.5	Open source
4	Python 3.7	Open source
5	MYSQL	Open source
6	Python	Open source
7	Ubuntu OS	Open source
8	Oracle Virtual Box	Open source
9	Arduino IDE 1.8.13	Open source
10	Raspbian OS	Open source
11	Notepad ++	Open source
12	JDK 15.0.2	Open source

Classroom Aids

The aids required to conduct sessions in the classroom are:

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

Note:

The Tools, Equipment, Software and other lab facilities are shared between Qualifications and batches.

Annexure 3: Industry Validations Summary

Provide 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	Anvation Lab	Mr.Alok Pugalia		Bangalore	8297188867	alok.pugalia@anvationlabs.com	
2	Go Digit	Mrs.Deepthy		Bangalore	7219166216	deepthy.m@godigit.com	
3	Delopt	Mrs.Seema		Bangalore	9845094553	hr@delopt.co.in	
4	Lucid Imaging	Mrs.Vidhya		Bangalore	7619211007	vidhya@lucidimaging.in	
5	Applied Materials	Mr.John		Bangalore	8066283840. 7338636327	John_Kumar@contractor.amat.com, Vidya_Bheemaiah@amat.com	
6	ThoughtWorks	Mr.Ganesh		Bangalore	8754491374	stepchennai@thoughtworks.co m	
7	Samsung	Mr.Sumit		Bangalore	8826363651	sumit.premi@samsung.com	
8	By Tech India	Mr.Murali		Bangalore	7760965733	hadmin.blr@bytechin dia.com	
9	Unibiz	Mrs.Prachi		Bangalore	080-40431501	Prachih@in.unibiz.com	
10	Aliment Software Technologies	Mrs.Jayanthi		Bangalore	9900179294	jayanthi@alimentglobal.com	
11	Everest IMS	Mrs.Soumya		Bangalore	9663375546	hr@everest-ims.com	
12	Quali Test	Mr.Mathew		Bangalore	9620774897	mathai.mathew@qualitestgroup.com	
13	Happiest Mind	Mr.Balaji		Bangalore	8061960731	Not available	
14	UncannyVision	Mr.Kiran		Bangalore	9743607299	kiran.sonar@uncannyvision.com	
15	Toshiba	Mr.Sermaichamy		Bangalore	8884575263	seemai@wimerasys.com	
16	Smart Ice	Mr.Ravikumar		Bangalore	8867106900	Not available	
17	Diya Systems	Mr.Srinivas bhat		Bangalore	7022627311	shrivas.b@glowtouch.com	
18	Hgs	Mr.Thomotharan		Bangalore	9743501143	Not available	
19	Tata Elxsi Ltd	Ms.Chaitra.M		Bangalore	8022979687	chaitram @tataelxsi.co.in	
20	Pari Automation	Mr.Dheraj		Bangalore	8380097138	dhirajc@p arirobotics.com	
21	NI	Mr.Harsha Thammaiah		Bangalore	9591997400	niranjan.bv@ni.com	

22	L&T	Mr.SamirMahato		Bangalore	9740800907	Samir.Mahato@LntTechservices.com	
23	Shiksha Infotech	Mrs.Jyothi		Bangalore	9976048657	jyoti.katare@shikshainfotech.com	
24	By Tech India	Mr.Murali		Bangalore	7760965733	hradmin.blr@bytechindia.com	
25	CovalenceSystems	Mr. Ravi V		Bangalore	NIL	ravi.veeraswamy@covalensedigital.com	
26	Nxt-Gen	Mr.Suveen		Bangalore	9886302009	suveen@nxtgen.com	
27	Frontier	Mrs.Renee		Bangalore	9844244299	renee@frontier.in	
28	Tarems Technology	Mr.Prashanth Murunnikara/ Mr. Subhbrata Maity		Bangalore	9886488014/ 9740793456	prasanth.murunnikara@tarams.com	
29	Computer Sciences Corporation India Pvt Ltd	Mr.ArhamHusain		Bangalore	9980076150/ 8032485136	ahusain2@csc.com	
30	Melange Systems Private Limited,	Mr.Sairam Kummara/ Mr.vijay		Bangalore		vijay@melangesystems.com/ sairam.kummara@melangesystems.com	
31	Skypro Technologies	Mr. Hussain		Bangalore	080-22979687 / 9886886884	athiya@skyprotechnologies.com/ hussain@skyprotechnologies.com	
32	Kites Software India Pvt.Ltd	Mr.Sreejith		Bangalore	9916320857/ 8892963692/ 9731969978	sreejith@kitesnet.com	
33	Terance System India Pvt.Ltd	Mr.Nandhan		Bangalore	09846700726 0484-2345686	nandan.ajeton@gmail.com	
34	Future Focus Infotech	Mr.SidharthaAhiuwalia		Bangalore	9845029428	sidhartha @focusite.com	
35	Virtual Technologies	Mr.Vishvanadhan		Bangalore	9845481482	virtualtech@vsnl.net	
36	Baryons Solutions	Ms.Shweta		Bangalore	9448352924, 080-25563591	shweta@baryonssoftsolutions.com	
37	Acropetals Technology	Mrs.Vandana		Bangalore	2536 6478 / 2554 2904	vandana.rao@acropetal.com	
38	Collabera Technologies	Mrs.Devaki S		Bangalore	8939182320, +91-449018400	devaki.selvarangam@collabera.com	

Annexure 4: Training & Employment Details**Training and Employment Projections:** Data to be provided year-wise for 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	400	More than 5000	200	More than 2000	-	-
2024	500	More than 5000	250	More than 2000	-	-
2025	600	More than 5000	300	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	Trained	Assessed	Certified	Placed	Trained	Assessed	Certified	Placed
	2017- 2020	209	180	179	179	79	74	74	74	NIL			
	2018 - 2021	153	142	141	141	41	40	40	40				
	2019 - 2022	162	159	150	150	42	42	38	38				

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: NOT APPLICABLE****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>

Sl. 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	80:20
2	Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners	Physical classroom, Workshops, Mock sessions, Case study, Role play, Group Discussions, LMS	85:15
3	Showing Practical Demonstrations to the learners	Workshop / Lab, Video recording, Simulators	70:30
4	Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	Workshop machines, Lab equipment, Simulators, Mini projects, Project	70:30
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					
Data Structures with C	Introduction to Data Structure-Types and Applications	15	-	-	-
	Stacks-Conversion and Evaluation in Stack	15	-	-	-
	Queues-Types of Queues and application	20	-	-	-
	Linked Lists- Types of Linked List and its application	20	-	-	-
	Trees-Types and Operations	10	-	-	-
	Sorting, Searching-Types and applications	20	-	-	-
	Total Marks	100			
Object Oriented Programming with C++	Introduction to OOP and C++ Features	20	-	-	-
	Classes and Objects, Concept of OOPS –Applications	30	-	-	-
	File and Streams-Types and Applications	30	-	-	-
	Exception Handling-Applications	20	-	-	-
	Total Marks	100			
Setting and Configuring Computer Networks - II	LAN Security Concepts and configuration	15	-	-	-
	WLAN Concepts and configuration	15	-	-	-
	Routing Concepts and configuration	20	-	-	-
	Network Security Concepts and Management	20	-	-	-
	ACL Concepts	15	-	-	-
	Network Virtualization & Automation	15	-	-	-
	Total Marks	100			

Microprocessor and Microcontroller	Introduction to Microprocessors evolution and Architecture	10	-	-	-
	Memory Interfacing-Concepts	10	-	-	-
	Programming 8085, Interrupts of 8085 –Program Logic and selection of interrupts	20	-	-	-
	Introduction to Microcontroller, 8051 Architecture	15	-	-	-
	Programming of 8051	20	-	-	-
	Timers and Interrupts of 8051	15	-	-	-
	8051 Application examples using Assembly language	10	-	-	-
	Total Marks	100			
Installation and Configuring Operating Systems	Introduction Operating systems, Process Concept-Types and applications	20	-	-	-
	CPU scheduling, Process Synchronization-Types and applications	25	-	-	-
	Deadlocks, Memory Management--Types and applications	20	-	-	-
	Virtual Memory, File System Interface and Implementation	15	-	-	-
	Secondary Storage Structure, Real-Time Operating Systems-Applications	20	-	-	-
	Total Marks	100			
Employability Skill	Diversity and Inclusion, Gender sensitivity PwD etc.	15	-	-	5
	Career development and Goal setting	20	-	-	10
	Entrepreneurship	15	-	-	5
	Analytical thinking and Adaptive Thinking	25	-	-	5
	Total Marks	100			
OOPS with C++ Lab	Write a C++ program to implement oops concepts	-	15	-	5
	Implement Function overloading	-	20	-	5
	Implement Operator overloading	-	15	-	5
	Implement Inheritance and File Concepts	-	15	-	5
	Perform Exception handling mechanism	-	15	-	-
	Total Marks	100			

Data Structures with C Lab	Perform Call by Value and Call By Reference	-	15	-	-
	Verify Stack operations	-	20	-	5
	Perform Prefix and infix operations in stack	-	15	-	5
	Implement Queue	-	15	-	5
	Perform linked list operations	-	15	-	5
	Total Marks		100		
Setting and Configuring Computer Networks – II Lab	Configure secure LAN and Wireless LAN	-	10	-	-
	Configure static and dynamic (OSPF) routing	-	10	-	-
	Implement access control list to secure the network	-	15	-	5
	Configure PAT interface implementation and verify NTP settings	-	15	-	5
	Implement NAT concept for IP address translation	-	15	-	5
	Configure TFTP server for backup	-	15	-	5
	Total Marks		100		
Microprocessor and Microcontroller Lab	8085 Microprocessor assembly language programming	-	30	-	5
	8051 Microcontroller assembly language programming	-	25	-	10
	Interfacing programs using 8051 with Embedded C	-	25	-	5
	Total Marks		100		
Semester – 4					
Software Engineering	Software Engineering Overview	20	-	-	-
	Software Development Life Cycle-Types and applications	30	-	-	-
	Requirement Engineering	20	-	-	-
	Software Design, Coding, Software Testing-Types and implementation	30	-	-	-
	Total Marks		100		
Java Programming	Introduction to Java	10	-	-	-
	Operators and Statements-Types and applications	20	-	-	-

	Working with OOP's-Types and applications	15	-	-	-
	Packages and Interfaces-Types and applications	15	-	-	-
	Exceptions, Multithreading-Types and applications	10	-	-	-
	Basic I/O, Java Packages	10	-	-	-
	Applets and GUI-Types and applications	20	-	-	-
	Total Marks	100			
Windows Server Administration and Linux Server Administration	WSA: Networking Essentials & Introduction to Windows server 2012	20	-	-	-
	Active Directory – Domain Services, User and Group Administration	15	-	-	-
	Domain Name System (DNS) & Internet Information Services	20	-	-	-
	Introduction about Linux, Text Processing Tools	15	-	-	-
	Basic User/group administration File system administration	15	-	-	-
	Basic Network administration	15	-	-	-
	Total Marks	100			
IoT	Internet of things-market opportunities and use cases	15	-	-	-
	Arduino-Applications	20	-	-	-
	ESP8266	15	-	-	-
	RASPBERRY Pi-Applications	20	-	-	-
	Embedded development using Intel Up Squared based IoT Development kit	15	-	-	-
	Integration of Intel UP Squared with Cloud based platforms	15	-	-	-
	Total Marks	100			
Web programming (Java Script, Perl, PHP, Python)	JavaScript-Applications and Operations	30	-	-	-
	PHP, PERL- Applications and Operations	40	-	-	-
	Python Django Framework- Applications and Operations	30	-	-	-
	Total Marks	100			
Employability Skill	Financial and Legal Literacy	15	-	-	5
	Occupation Safety, Health, and Environment Education	20	-	-	10
	Digital Literacy Skills	15	-	-	5
	Essential skills for Success	25	-	-	5
	Total Marks	100			

Web programming (Java Script, Perl, PHP, Python) Lab	Various operations in JavaScript-Validation, Decision making, looping	-	20	-	5
	Perform various operations in PHP-functions, GET and POST method	-	20	-	5
	Perform various operations in PERL-Array functions, Hash, Searching, Sorting	-	20	-	5
	Develop a website using Django framework	-	20	-	5
	Total Marks	100			
Windows Server Administration and Linux Server Administration Lab	Configure Different Server Roles in Windows Server 2012R2	-	20	-	5
	Perform operations of Server Administrator and System Administrator	-	20	-	5
	Installing and configuring DHCP, IIS, DNS	-	20	-	5
	Configure the Different Roles Linux Server.	-	20	-	5
	Total Marks	100			
Java Programming Lab	Verify the basics of Java (How to download and Install the JDK)	-	20	-	5
	Implementation of oops concept	-	20	-	5
	Perform constructor overloading	-	20	-	5
	Build a desktop application	-	20	-	5
	Total Marks	100			
IoT Lab	Develop a real time IoT based project using Intel up square board	-	15	-	5
	Installation of Arduino, ESP8266, Raspbian OS	-	10	-	5
	Experiment on Servo motor and DC motor	-	10	-	-
	Develop an application using raspberry Pi in cloud platform	-	15	-	5
	Build an application with Intel IoT kit	-	15	-	5
	Creating task-oriented shell scripts.	-	15	-	-
	Total Marks	100			
OJT	On the Job Training in the relevant sector	-	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 Shop floor 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.nttftg.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

Annexure 8: Model Curriculum

Semester 3		Module Name: Data Structure with C	Module Code: CP08306T
Sl. No.	Module Details		Theory Hours 60
1	Introduction		7h
2	Stacks		8h
3	Queues		9h
4	Linked Lists		15h
5	Trees		11h
6	Sorting		6h
7	Searching		4h
Semester 3		Module Name: Object Oriented Programming with C++	Module Code: CP08307T
Sl. No.	Module Details		Theory Hours 60
1	Introduction to OOP		4h
2	C++ Features		9h
3	Classes and Objects		15h
4	Concept of OOPS		18h
5	File and Streams		12h
6	Exception Handling		2h
Semester 3		Module Name: Setting and Configuring Computer Networks-II	Module Code: CP08308T
Sl. No.	Module Details		Theory Hours 60
1	LAN Security Concepts		3h
2	Switch Security Configuration		3h
3	WLAN Concepts		4h
4	WLAN Configuration		3h
5	Routing Concepts		3h
6	IP Static Routing		5h
7	OSPF Concepts and Configuration		5h
8	Network Security Concepts		5h
9	ACL Concepts		2h
10	ACLs for IPv4 Configuration		3h
11	NAT for IPv4		4h
12	Wan Concepts		2h
13	VPN and IPsec Concepts		2h
14	QoS Concepts		2h
15	Network Management		4h
16	Network Design		2h

17	Network Trouble Shooting	3h
18	Network Virtualization and Automation	5h
Semester 3 Module Name: Microprocessor and Microcontroller Module Code: CP08309T		
Sl. No.	Module Details	Theory Hours 60
1	Introduction to Microprocessors	3h
2	Memory Interfacing	4h
3	8085 Microprocessor Architecture	4h
4	Programming 8085	7h
5	Interrupts of 8085	3h
6	Introduction to Microcontroller	2h
7	8051 Architecture	8h
8	Programming of 8051	12h
9	Timers and Interrupts of 8051	7h
10	8051 Application examples using Assembly language	10h
Semester 3 Module Name: Operating System Module Code: CP08310T		
Sl. No.	Module Details	Theory Hours 60
1	Introduction Operating systems	5h
2	Process concept	6h
3	CPU scheduling	7h
4	Process synchronization	5h
5	Deadlocks	7h
6	Memory Management	7h
7	Virtual Memory	6h
8	File System Interface and Implementation	7h
9	Secondary Storage Structure	7h
10	Real-Time Operating Systems	3h
Semester 3 Module Name: Object Oriented Programming with C++ Lab Module Code: CP08311P		
Sl. No.	Module Details	Practical Hours 60
1	Write a C++ program to add two numbers using class concepts	3h
2	Write a C++ program to swap two numbers using class concepts	3h
3	Write a C++ program to display student details by using class concepts	3h
4	Create an overloaded function in C++ to convert string to integer and to convert string to float.	3h
5	Write a C++ program to perform overloading of binary operators	4h
6	Write a C++ program to create a class called as complex, and implements the following by overloading the function ADD that returns the COMPLEX number	3h
	a) ADD (s1,s2)-where s1 is an integer (real part) and s2 is a COMPLEX number.	

	b) ADD (s1, s2)- where s1&s2 are complex numbers	
	c) Display the objects by using display function.	
7	Write a C++program to create a class STRING and implement the following. Display the results by overloading the operator << after every operation a) STRING s1="NTTF-NEC" b) STRING s2 = " BANGALORE" c) STRING s3 = s1 +s2;	3h
8	Write a C++ program to create a class called MATRIX using two- dimensional array of integers. Implement the following by overloading the operator==,which checks the compatibility of two Matrices to be added and subtracted, perform the following by overloading + and –operators. The program should read the matrix using >> operator and display the results by overloading the operator<< if(m1==m2) { m3 = m1+m2; m4 = m1-m2; } Else Display appropriate error message.	3h
9	Write a C++program to overload pre-increment, decrement and post increment, decrement operators.	3h
10	Write a C++ program to create a class called DATE; accept two valid dates inform of dd/mm/yyyy. Implement the following by over loading operators – and +.Display the results by over loading the operator << after every operation a) No of days=d1-d2–whered1andd2aredateobjects; d1>=d2; and no _of _days is an integer b) d1 =d1+no _of _days where d1 is a date object and no _of _days is a integer	6h
11	Write a C++program to create a base class called student (name, regno, gender, and branch) and using inheritance create a derived class exam with fields (subject, marks, and semester) enter at least 4 students. Find total & average marks for each semester separately and the average of all semester.	6h
12	Create a class EMPLOYEE contains members (emp_id, emp_name, basic salary, net salary). Create a derived class INCOME contains the members (DA, HRA) Another derived class DEDUCTION consists (IT –Income Tax, LIC) Use appropriate functions to read data and calculate the net salary and print the complete data of multiple employees. (DA = 50% of the basic, HRA=25% of Basic, IT=30% of the Gross salary, LIC=1800)	3h
13	Create a base class Student (roll_no, name, sem) from which derive two derived class Test (part A, part B marks) and Sports(sports mark).Create one more derived class Result(total)which has to inherit the properties of Test, Sports. Create appropriate functions in each class to read the data, calculate the total and display complete details in derived class by using Virtual Base class concept.	3h

14	Create a base class called Shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function get data () to initialize base class data members and another member function display area() to compute and display the area of figures, Make display area() as a virtual function and redefine this function in the derived classes to suit their requirements	3h
15	There are 100 records present in a file with each record containing Item code, 20 characters Item name and an integer Quantity. Write a program to read these records, arrange them in ascending order and write in a same file over writing the earlier records.	3h
16	A book shop maintains the inventory of books that are being sold at the shop the list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the salesperson inputs the title and author, and the system searches the list and displays whether it is available or not. If it is not an appropriate message is displayed. If it is, then the system displays the book details and request for the no. of copies required. If the requested copies are available the total cost of the requested copies is displayed, otherwise the message "Requested copies not available " Write a C++ program read book inventory records from a file and implement the same.	5h
17	Write a C++ program to demonstrate the Exception handling for Division by zero exception and Array Index out of bounds exception	3h
Semester 3 Module Name: Data Structures with C Lab Module Code: CP08312P		
Sl. No.	Module Details	Practical Hours 60
1	Write a C program to find the biggest of N numbers in an array using pointers	1h
2	Write a C program to demonstrate call by value	1h
3	Write a C program to demonstrate call by reference	1h
4	Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.	1h
5	Write a C program to demonstrate the working of a stack of size N using an array. The operations supported are 1. Push 2. Pop 3. Display The program should check the stack overflow, underflow conditions	3h
	Write a C program to evaluate a valid suffix expression-using stack. Assume that the suffix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators allowed are	3h
6	+ (ADD), - (SUBTRACT), *(MULTIPLY), and / (DIVIDE).	
7	Write a C program to evaluate a valid prefix expression-using stack. Assume that the prefix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators.	3h
	The arithmetic operators allowed are +(ADD), -(SUBTRACT), *(MULTIPLY), and /(DIVIDE).	

8	Write a C program to convert and print a given valid infix arithmetic expression to Suffix or Postfix expression. The expression consisting of single character (letter or digit) as operands and +, -, *, / as operators. You may assume that only binary operators are allowed in the expression.	6h
9	Write a C program to demonstrate the working of a queue of size N using an array. The operations supported are 1. QInsert 2. QDelete 3. QDisplay The program should check the queue overflow, underflow Conditions	3h
10	Write a C program to simulate the working of a circular Queue using an array.	3h
11	Write a C program to simulate the working of Double-Ended Queue, provide the following operations 1. INSERT FRONT 2. INSERT REAR 3. DELETE FRONT 4. DELETE REAR 5. DISPLAY	3h
12	Write a C program to design a Priority queue, which is maintained as a set of queues (Assume maximum of three queues). The elements are inserted based upon the given priority. For eg. (3,34) will be inserted on 3 rd queue with elemental value 34. The deletion of elements to be done starting from 1 st queue if it is not empty. If it is empty then the elements from the 2 nd queue will be deleted and so on	6h
13	Using pointers and Dynamic memory, write a program in C to construct singly linked list consisting of following information on each node: Job_id (int), Job name (character string), Job category (character string). The operation supported are 1. LINSERT- Inserting a node based on Job_id(Ascending order) 2. LDELETE – Deleting a node based on Job_id. 3. LSEARCH – Searching a node based upon Job_id. Printing all the nodes in the list	6h
14	Write a C program to simulate the working of Doubly linked list and perform forward and backward directional display	3h
15	Write a C program to simulate the working of Circular singly linked list	3h
16	Write a program to reverse a singly linked list without creating a new node.	7h
17	Write a program in C to construct a Binary Search Tree (BST). And perform all traversals on it	7h
Semester 3 Module Name: Setting and Configuring Computer Networks - II Lab Module Code: CP08313P		
Sl. No.	Module Details	Practical Hours 60
1	Implement Port Security -Configure Port Security -Verify Port Security	3h
2	Switch Security Configuration -Create a Secure Trunk -Secure Unused Switch ports -Implement Port Security -Enable DHCP Snooping -Configure Rapid PVST Port Fast and BPDU Guard	3 h

3	Configure a Wireless Network -Connect to a wireless router -Configure the wireless router -Connect a wired device to the wireless router -Connect a wireless device to the wireless router -Add an AP to the network to extend wireless coverage -Update default router settings	3 h
4	Configure a Basic WLAN on the WLC -Monitor the WLC -Create a Wireless LAN -Connect a Host to the WLAN	3 h
5	Configure a WPA2 Enterprise WLAN on the WLC -Create a new WLAN -Configure a DHCP Scope and SNMP -Connect Hosts to the Network	3 h
6	Basic Router Configuration Review -Assign static IPv4 and IPv6 addresses to the PC interfaces. -Configure basic router settings. -Configure the router for SSH. -Verify network connectivity	3 h
7	Configure IPv4 Static Routes -Configure Directly Connected Static Routes -Configure Default Static Routes	3 h
8	Configure IPv6 Static Routes -Configure Directly Connected Static Routes -Configure Default Static Routes	3 h
9	Point-to-Point Single-Area OSPFv2 Configuration -Configure Router IDs. -Configure Networks for OSPF Routing. -Configure Passive Interfaces. -Verify OSPF configuration.	3 h
10	Modify Single-Area OSPFv2 -Modify OSPF Default Settings -Verify Connectivity	3 h
11	Propagate a Default Route in OSPFv2 -Propagate a Default Route	3 h

	-Verify Connectivity	
12	Configure Numbered Standard IPv4 ACLs -Plan an ACL Implementation -Configure, Apply, and Verify a Standard ACL	3 h
13	Configure Named Standard IPv4 ACLs -Configure and Apply a Named Standard ACL -Verify the ACL Implementation	3 h
14	Configure Extended IPv4 ACLs -Configure, Apply and Verify an Extended Numbered ACL -Configure, Apply and Verify an Extended Named ACL	3 h
15	Configure Static NAT -Configure Static NAT -Test Access with NAT	3 h
16	Configure Dynamic NAT -Configure Dynamic NAT -Verify NAT Implementation	3h
17	Configure PAT -Configure PAT using an Interface -Verify PAT Interface Implementation	3 h
18	Configure and Verify NTP -Configure the NTP Clients -Verify NTP settings	3 h
19	Back Up Configuration Files -Establish Connectivity to TFTP Server	3 h
20	Use a TFTP Server to upgrade a Cisco IOS Image -Upgrade an IOS Image on Cisco Device -Backup an IOS Image on a TFTP Server	3h
Semester 3 Module Name: Microprocessor and Microcontroller Lab Module Code: CP08314P		
Sl. No.	Module Details	Practical Hours 60
I	8085 MICROPROCESSORS	24h
1	Familiarization of 8085 simulator	2h
2	Loading of Four bytes in the Registers A, B, C, D & moving them to consecutive location 8000H through 8003H.	4h
3	a) Add two 8-bit numbers, without carry, storing the result in location 9000H. (Including Decimal Addition).	4h
	b) Subtract an 8-bit number from another 8-bit number and store the difference in location 9000H	

4	Add of two 16-bit numbers, with carry, storing the result in location 9010H (LSB) AND 9011H (MSB)	4h
5	Find 1's complement & 2's complement of an 8-bit number and place the result in 9000H and 9001H.	4h
6	a) Multiplication of Two 8-Bit Numbers	4h
	b) Division of 8-bit number with an 8-Bit Number	
7	Shift an 8-bit number to the left by 2 Bits and storing it in 9000H	2h
II	8051 MICROCONTROLLER LAB.	18h
8	Familiarization of keil compiler	2h
9	Write a program to place the number 80DH in RAM locations from 30H to 40H	2h
10	Write a program to copy the contents of DPTR to registers R0 (DPL) & R1 (DPH)	2h
11	Write a program to exchange the contents of B register and RAM address 30H	2h
12	Write a program to Swap the bytes in timer 0. Put TL0 in TH0 and TH0 in TL0	2h
13	Write a program to double the number in register R2 and put the result in register in R3 (higher byte) and R4 (lower byte).	2h
14	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
15	Write a program to move a block of data from memory X to Y.	4h
III	Interfacing programs with 8051 USING C	18h
16	LED & Switch Interfacing and display the status using LED	6h
17	Seven Segment Display Interfacing	4h
18	Alpha Numeric LCD Interfacing	4h
19	4x4 Keypad Interfacing	4h

Semester 3		Module Name: Employability Skills	Module Code: CP08315T
Sl. No.	Module Details		Theory Hours 30
1	Diversity and Inclusion, Gender sensitivity PwD etc.		8h
2	Career development and Goal setting		8h
3	Entrepreneurship		7h
4	Analytical thinking and Adaptive Thinking		7h

Semester 4		Module Name: Software Engineering	Module Code: CP08406T
Sl. No.	Module Details		Theory Hours 40
1	Software Engineering Overview		5h
2	Software Development Life Cycle		10h
3	Requirement Engineering		8h
4	Software Design		6h
5	Coding		6h
6	Software Testing		5h

Semester 4 Module Name: JAVA Programming Module Code: CP08407T		
Sl. No.	Module Details	Theory Hours 60
1	Introduction to Java	7h
2	Operators & Statements	3h
3	Working with OOP's	7h
4	Packages and Interfaces	6h
5	Exceptions	6h
6	Multithreading	7h
7	Basic I/O	4h
8	java.lang package	4h
9	java.util package	7h
10	java.io package	4h
11	Applets and GUI	5h
Semester 4 Module Name: Windows Server Administration and Linux Server Administration Module Code: CP08408T		
Sl. No.	Module Details	Theory Hours 60
1	WSA: Networking Essentials and Introduction to Windows server 2012	6h
2	Active Directory – Domain Services	4h
3	User and Group Administration	3h
4	Dynamic Host Configuration Protocol (DHCP) and Windows Deployment Services	4h
5	Domain Name System (DNS) and Internet Information Services	4h
6	Disk Management and Advanced Topics and Share Point	2h
7	Hyper V	4h
8	Microsoft Exchange Server 2010 (Mail Server)	3h
9	Introduction about Linux	1h
10	Working with File systems	3h
11	Installing Linux	3h
12	Boot sequence, Run level and rc scripts	3h
13	Text Processing Tools	3h
14	Basic User/group administration	3h
15	Basic File system administration	3h
16	Basic process and GUI administration	3h
17	Basic Network administration	3h
18	Backup and recovery	2h
19	Basic Troubleshooting	3h
Semester 4 Module Name: IoT Module Code: CP08409T		

Sl. No.	Module Details	Theory Hours 60
1	Internet of things-market opportunities and use cases	2h
2	Arduino	14h
3	ESP8266	10h
4	RASPBERRY Pi	14h
5	Embedded Development using Intel Up Squared based IoT Development kit	10h
6	Integration of Intel UP Squared with Cloud based platforms	10h
Semester 4 Module Name: Web Programming (JavaScript, Perl, PHP, Python) Module Code: CP08410T		
Sl. No.	Module Details	Theory Hours 60
1	Introduction to JavaScript	2h
2	Core Language Data Types and Variables	1h
3	Operators, Expressions, and Statements	2h
4	Functions	2h
5	Array, Date, Math, and Type-Related Objects	3h
6	Regular Expressions	3h
7	Fundamental Client-Side Java Script	1h
8	The Standard Document Object Model	3h
9	Form Handling	1h
10	Introduction to PHP	3h
11	Operators and Flow Control	2h
12	Strings and Arrays	3h
13	Creating Functions	3h
14	File Handling	3h
15	Reading Data in Web Pages	5h
16	Cookies and Sessions	2h
17	Working with Databases	2h
18	Introduction to PERL	2h
19	Lists , Hashes and Array Variables	2h
20	Reading from and writing to files	2h
21	String Manipulations and Regular expression	2h
22	Introduction to Common Gateway Interface (CGI)	1h
23	Python Django Web framework	10h
Semester 4 Module Name: WEB Programming Lab (JavaScript, Perl, PHP, Python) Lab Module Code: CP08411P		
Sl. No.	Module Details	Practical Hours 60
1	JAVASCRIPT	20 h
1.1	a) Write a Java Script to demonstrate document. Write () and display "HELLO JAVASCRIPT"	2h

	b) Write a Java Script to demonstrate alert box and display "HELLO JAVASCRIPT"	
	c) Write a Java Script to demonstrate the use of prompt box and read the name of user and display a message like "HELLO NAME HOW ARE YOU"	
	Write a JavaScript to display a confirm box	
1.2	a) Write a JavaScript that should declare a variable, assign a value to it, display the value, change the value, and display the value again. b) Write a JavaScript to Display "Good morning" If the time on your browser is less than 10. Otherwise display "Good day". c) Write a JavaScript to generate different greetings based on what day it is. Note that Sunday=0, Monday=1, Tuesday=2, etc. (use switch) d)Write a JavaScript to generate a table of numbers using while loop a. Implement multiplication table using do-while loop in Java Script b. Write a JavaScript to generate a table of even numbers using for loop	4h
1.3	Write a function using Java Script with both argument and return value	2h
1.4	a) Create an array store some data into it and print it, use for...in loop for printing b) Create an array store some elements into it sort it and print the elements c)Write a script to describe the various Boolean values d)Write a script for manipulating dates using the methods of date object e) Write a script to realize the usage of all the methods of math object f) Write a script to realize the usage of all the methods of string object	6h
1.5	a) Use DOM methods and create a simple HTML creation tool b) Write a script to manipulate the common CSS properties c)Write a script to change the common properties of HTML tables	4h
1.6	Write a JavaScript which should perform form validation for the fields, such as name, age and email address while submitting the form, add a Reset button	2h
2	PHP	16 h
2.1	Demonstrate on arithmetic and relational operators in PHP	1h
2.2	Demonstrate on if, if else, else if and switch Statements in PHP	1h
2.3	Demonstrate on while, do while, for and for each loop in PHP	1h
2.4	Write a program to demonstrate on function with parameters and return values	1h
2.5	Write a program to sort the elements in the array	2h
2.6	Demonstrate on get and post method	2h
2.7	Design a form with radio button and checkbox submit the value	2h
2.8	Use cookie to create page counter and demonstrate session	1h
2.9	Write a program to read the content from a file and write it to another file	2h
2.1	Write a program in PHP to insert, update, delete and retrieve record in the table	3h

3	PERL	12 h
3.1	Write a PERL program to demonstrate array functions	2h
3.2	Write a PERL program to copy content of one file to another file	2h
3.3	Demonstrate search and sort operation in hash using PERL	4h
3.4	Demonstrate string manipulation functions in PERL	2h
3.5	Demonstrate usage of Regular expressions in PERL program	2h
4	Python Django Web framework	12 h
4.1	How to setup a project?	1h
4.2	How to display Hello World in browser using Django?	1h
4.4	How to apply migrations & What is migrations does?	0.5h
4.5	How to access Django admin panel?	1h
4.6	How to connect MYSQL or ... (except sqllite3) in a Django application?	0.5h
4.7	How to create a table in database & what is ORM?	1h
4.9	What is Jinja? Displaying a list of items using Jinja for loop?	1h
4.1	How to methods like POST & GET works?	1h
4.11	How to create form using models?	2h
4.12	Develop a web application to create employee registration site	3h
Semester 4 Module Name: Windows Server Administration and Linux Server Administration Lab Module Code: CP08412P		
Sl. No.	Module Details	Practical Hours 60
1	Installation of Windows 2012 r2 Server	2h
2	Installing and Configuring Active Directory Services Installing additional domain controller Installing core server 2012r2 Child domain creation and additional DC Creation	5h
3	Creating and Managing User and Group Accounts Creating users with various properties eg: expire date Demo the password policy Create user template Create groups and add computers to groups Create and manage organizational units configure the delegation	2h
4	Group policies : Local group Group policy objects Installing and uninstalling software using GPO Configuring Roaming profiles and Home Folders	2h
5	Configuring read only domain controller	2h

6	Configuring trusts	2h
7	Installing and configuring DHCP	2h
8	Installing and configuring IIS and DNS	2h
9	Backup and recovery	2h
10	Share point Installation and Hyper V	2h
11	Windows PowerShell	2h
12	VPN	3h
BASICS OF LSA		
13	Terminal Login Procedure Switching between virtual consoles and the graphical environment Basic commands: explore minimum 30 commands Running Commands and Getting Help Bash Shell: Finding and changing current shell, default shell and switch to another shell – ksh, c shell	2h
14	Text based installation	2h
15	GUI based installation	2h
16	Hardware overview Boot loader configuration Run levels Managing system V initializing scripts Controlling services Tools for Extracting – less, cat, head, tail, cut, and grep Tools for Analyzing – Wc sort , Uniq, comm, comp, diff – patch and aspell awk command basics Default permission – umask command	2h
17	Tools for Extracting – Vi Yy , Pp Tools for Analyzing – sed,vi-D,DW Tools for manipulating – tr and sed Awk command basics W! , Wset Deleting user account Understanding/ect/passwd file Creating Group (CLI mode and GUI mode) Adding a member to a group Removing a member from a group Understanding stuid , setgid , sticky bit	2h
18	Default permission – Umask command GUI configuration	2h

	Ifconfig, ifup, ifdown commands	
19	User/Group administration: V creating user (CLI mode and GUI mode) Changing username and password for created user Configuring the Expire date, default shell, Understanding/etc/passwd file Adding a member to a group Removing a member from a group	4h
20	Method of Fault Analysis Things to check: Networking Recovery Run – level File system Recovery	3h
21	PS command Nice and renice commands Interactive process Management Tools GUI configuration	3h
22	View all network setting Ifconfig , ifup,ifdown,commands Assign ip address, netmask, broadcast, MTU,new Alias and change MAC address to network interface Speed and Duplex Settings	
23	Configure a FTP server and client Configure and test DHCP Server Configure Apache Tomcat Server	8h
24	Method of Fault Analysis Things to check : Networking Recovery Run – levels File system Recovery	2h

Semester 4		Module Name: JAVA Programming Lab	Module Code: CP08413P
Sl. No.	Module Details	Practical Hours 60	
1	Write a program to display your Information on the Console.	1h	
2	WAP to use the Conditional Statements.	1h	
3	WAP to use the Control Statements.	1h	
4	WAP to pass Command Line Arguments and display the same on the console.	1h	
5	WAP to declare a String Array of with varying Width and display the content of the Array in the same manner in which the data is stored.	1h	

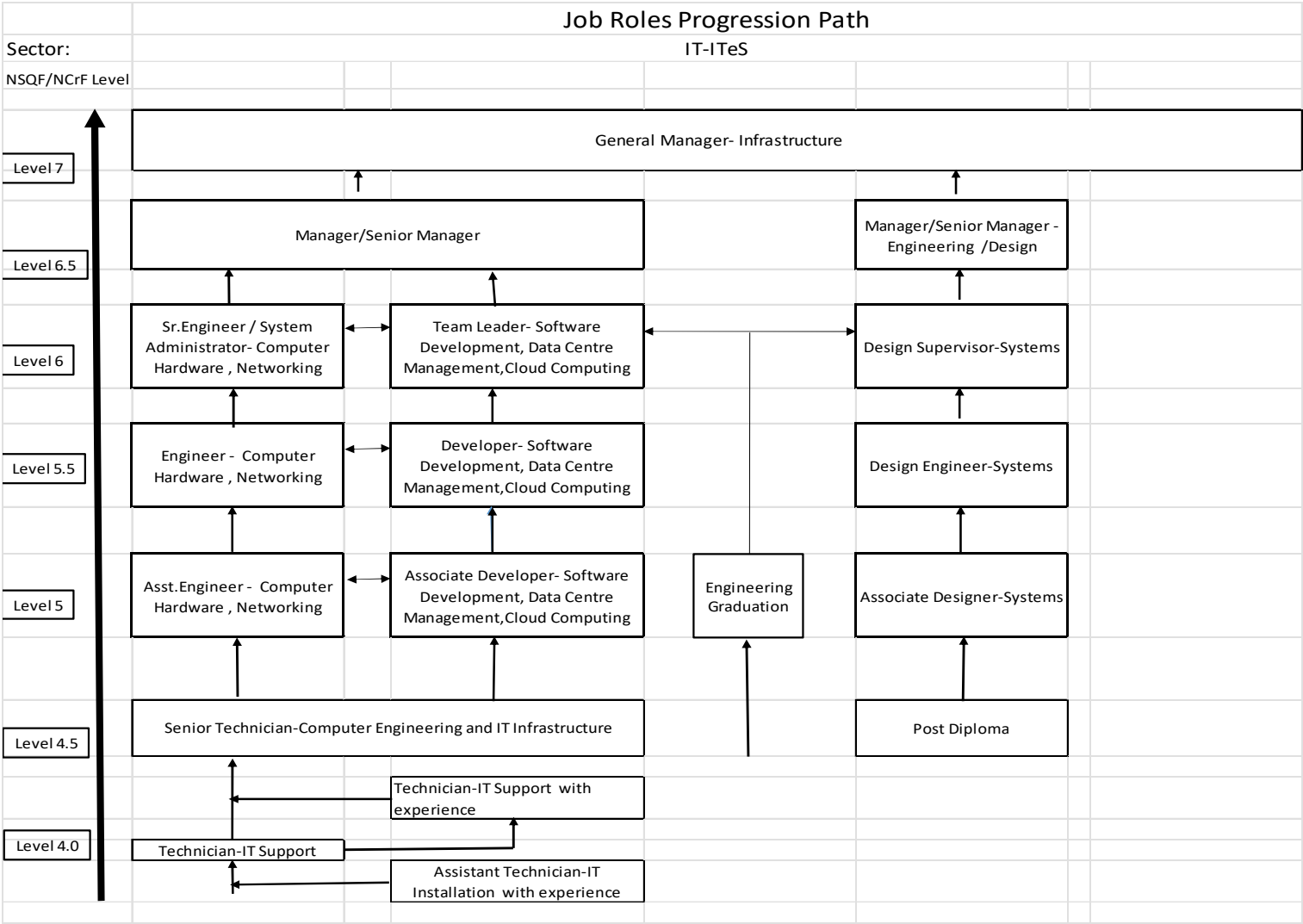
6	WAP to demonstrate the use of Operators.	2h
7	WAP to demonstrate Pass by Value and passing the Objects as Parameters.	2h
8	WAP to demonstrate Method Overloading and Method Overriding.	2h
9	WAP to demonstrate Constructor Overloading.	3h
10	WAP to use Abstract Classes.	2h
11	Create a Package and Import the same in the other class.	3h
12	Demonstrate the use of Access Modifiers with the help of Packages.	2h
13	WAP to demonstrate Multiple Inheritance with the help of Interfaces.	2h
14	WAP to handle the Exceptions.	2h
15	Demonstrate the use of 'try', 'catch', 'finally', 'throw' and 'throws' in Exception handling.	3h
16	Create your own Exception class and throw the same in the other class.	4h
17	WAP to demonstrate the Life Cycle of Thread.	2h
18	WAP to Create Multiple Threads and set the Priorities.	3h
19	WAP to demonstrate Thread Synchronization.	3h
20	WAP to take the Input from the User using Basic IO and display the output.	3h
21	WAP to demonstrate the use of static Methods and static Blocks.	3h
22	Demonstrate the use of transient in Serialization.	3h
23	Usage of String and String Buffer.	3h
24	WAP to create a Process and display the output given by that Process.	3h
25	WAP to set the System Properties.	2h
26	WAP to use Array List, Sort the Elements, retrieve the values and the Keys from the Map.	3h
Semester 4		Module Name: IoT LAB
		Module Code: CP08414P
Sl. No.	Module Details	Practical Hours 50
1	Installation of Arduino	1h
2	Installation of ESP8266	1h
3	Installation of Rasbian OS	2h
4	Experiment using Sound sensor	2h
5	Experiment using OLED interface with Arduino- Message display-Autoscroll-moving left and right	3h
6	Experiment using LED-Blinking and Chasing	2h
7	Object tracker using Arduino	3h
8	Experiment on Servo motor and DC motor	3h
9	Experiment using MQTT Publish and Subscribe messages	2h
10	Smart Home lighting system Raspberry Pi - Python programming	2h
11	Experiment using Water sensor- Moisture control	3h
12	Experiment using DHT temperature sensor	2h
13	Traffic Light project using Raspberry	2h

14	Colour based product sorting	3h
15	Software and Hardware installation in the lab Connecting Up Squared Board to internet using LAN and Wi-Fi	3h
16	UP Squared Grove IoT Dev Kit using Arduino Programming – GPIO Blink LED Program Grove Button Grove LCD Grove Light Sensor Grove Rotary Angle Grove Temperature and Humidity Sensor	8h
17	UP Squared Grove IoT Dev Kit using Python Programming – GPIO Blink Program UP2 Analog Sensor in UP2 UP2 using MQTT LED Control I2C interfacing LCD program using UP2 Temperature Humidity Plot on Firebase MQTT PWM_MRAA (Increase brightness of LED) Project on Temperature/Humidity on Twitter Account – MQTT	8h

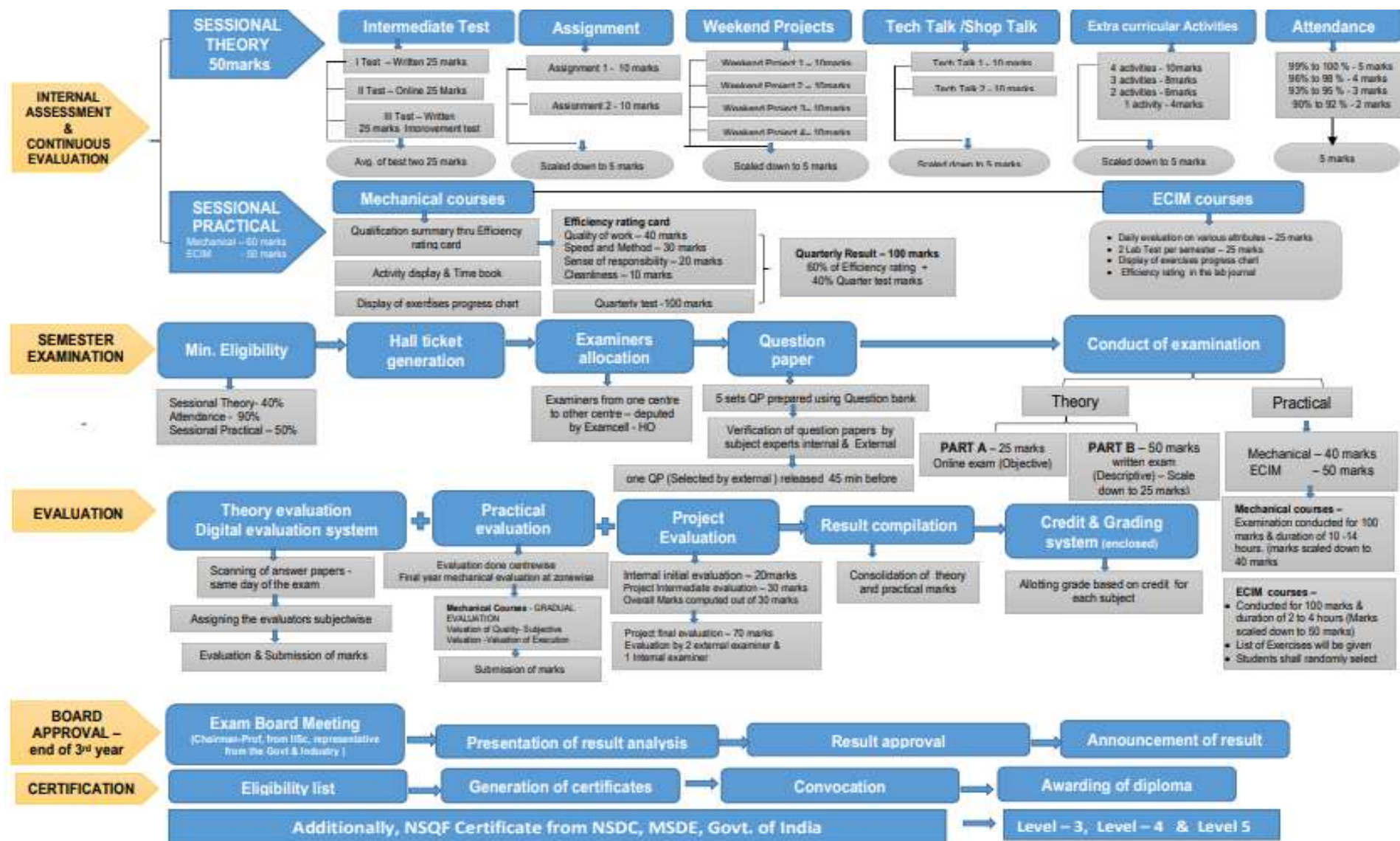
Semester 4		Module Name: Employability Skills	Module Code: CP08415T
Sl. No.	Module Details	Theory Hours 30	
1	Financial and Legal Literacy	7h	
2	Occupation Safety, Health, and Environment Education	8h	
3	Digital Literacy Skills	8h	
4	Essential skills for Success	7h	

Semester – IV		Module Name: OJT	Module Code: CP08416P
Sl. No.	Module Details	Practical Hours 90	
1	On the Job Training in the relevant sector	90h	

Annexure 9: Career Progression



Annexure 10: Assessment SOP



Annexure 11: Occupational Map**Sector Name: Computer and Information Technology**

As per NCrf		As per NCO-2015	Sub-Sector 1/Computers/Data centre management/ Cloud computing/Hardware and Networking	
NCrf Level (1-8)	Level Descriptors	NCO-15 -- Family (First 4 digits code/s for the given level cross cutting the OM Sub-Sectors / Occupations)	Occupation 1 /Electronics System design and Manufacturing	Occupation 2 /VLSI & Embedded System Design and Development
Level 8.0	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 7.0	1. Professional Theoretical Knowledge: Advanced knowledge with critical understanding of emerging developments 2. Professional and Technical Skills/ Expertise: Highly specialized skills, trans disciplinary 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 1330	GM -Infrastructure	GM Information Technology

Level 6.5	1. Professional Theoretical Knowledge: Advanced multidisciplinary and specialized knowledge 2. Professional and Technical Skills/ Expertise: Advanced Technical and Managerial Skills 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	2511 2512 2519 2521 2522	Manager/Senior Manager- Computer Hardware, Networking, Software development, Data center Management, Cloud computing. System Analysis	Manager/Senior Manager- Data center Management, Cloud computing. System Analysis
Level 6.0	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, self management 4. Broad Learning Outcomes: Judgement / decision making – specialized 5. Responsibility: Team leader – Junior technical supervisor, Technical supervisor or junior/ deputy manager	2511 2512 2519 2521 2522	Project Engineer - Computer Hardware, Networking, Software development, Data center Management, Cloud computing. System Analysis	Project. Engineer - Data center Management, Cloud computing. System Analysis
Level 5.5	1. Professional Theoretical Knowledge: Specialized knowledge 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	2512 2519 2522 2523 2529 3512	Sr. Engineer - Computer Hardware, Networking, Software development, Data center Management, Cloud computing. System Analysis	Sr. Engineer - Data center Management, Cloud computing. System Analysis
Level 5.0	1. Professional Theoretical Knowledge: Specialized knowledge 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	2512 2519 2523 2529 3512 3513	Engineer - Computer Hardware, Networking, Software development, Data center Management, Cloud computing. System Analysis	Engineer - Data center Management, Cloud computing. System Analysis

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 & Entrepreneurial readiness 4. Broad Learning Outcomes: Carry out Range of tasks and may provide range of solutions 5. Responsibility: Accountable/ responsible - Jr. Technician & Technician	2519 2523 2529 3512 3513	Senior Technician-Computer Engineering and IT Infrastructure, Computer-aided engineering analyst Programmer Machine Learner System Admin	Study Post Diploma Analyst AI based solutions. Senior Technical support Engineer Computer network Analyst
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	7422 3512 3513	Technician-IT Support Hardware driver developer Web designer Software developer	Technical support Engineer Linux system engineer Technical support computer network

Annexure 12: Key Learning Outcome

SL. NO.	MODULE NAME	KNOWLEDGE AND UNDERSTANDING	TECHNICAL & PROFESSIONAL SKILLS	APPLICATION OF KNOWLEDGE AND SKILLS
2nd Year				
01	Data Structures with C (CP08306T) Data Structures with C Lab (CP08312P) Understanding the Data Structures and their applications.	Understand how arrays, records, linked structures, stacks, queues, trees and graphs are represented. Describe common applications for arrays, records, linked structures, stacks, queues and trees. Concept of recursion and its implementation. Identify and deploy various search techniques in data structures.	Implement various data structure concepts stack, queue, linked list and trees. Explain different methods of tree traverse. Experiment searching and sorting in data structures.	Use stack for back tracking and systematic memory management. Apply Queue for handling website traffic. Ability to analyse algorithms and its correctness. Faster data retrieval and manipulation.
02	OOPS with C++ (CP08307T) OOPS with C++ Lab (CP08311P) Understanding C++ and OOPs concepts, writing and executing OOPs programs.	Identify the difference between C and C++ programming. Identify the object in an object-oriented system. Familiarization of OOPs concepts. Understand file concepts and exception handling.	Apply OOPs concepts in C++ programming. Implement Data hiding. Practice Function Overloading and Operator Overloading. Inheritance and Virtual function concepts. Implement File concepts and Exception Handling Mechanism. Problem solving skills, Design skills.	Apply OOPs concepts for developing new programming languages, Software Development, Web development. Create Client Server Systems. Create Object oriented Databases. Real Time System Design.

03	Setting and Configuring Computer Networks - II (CP08308T) Setting and Configuring Computer Networks – II Lab (CP08313P) Ability to create and configure different Networks and associated Protocols.	How to create secure LAN and Wireless LAN. Understand static and dynamic routing. Access control list to secure network. Understand NAT concept and network automation. Explain the use of network simulator in various networking application	Configure secure LAN and Wireless LAN. Configure static and dynamic (OSPF) routing. Implement access control list to secure the network. Configure PAT interface implementation and verify NTP settings. Implement NAT concept for IP address translation. Configure TFTP server for backup.	Enables the communication between End points guaranteed message delivery. Provide standard secure services in the network by controlling the access.
04	Microprocessor and Microcontroller (CP08309T) Microprocessor and Microcontroller Lab (CP08314P) Understanding the architecture of different Microcontrollers, their programming and interfacing with peripheral devices.	Describe and compare the architecture of 8085 Microprocessor and 8051 Microcontroller. Observe the difference between Opcode, mnemonics, operand and data. Choose the suitable circuitry to connect microcontroller I/O ports to connect external devices. Choose suitable simulator and compiler for the target microprocessor and microcontroller.	Perform assembly language programs for arithmetic, logical operations using 8085 simulator. Write programs using keil compiler (8051 microcontroller) for exchange, swap of data between registers, memory to register, register to memory, one timer to another timer. Recall C program and write C program for applications/interfacing modules using 8051 microcontroller.	Apply knowledge and programming proficiency using the various addressing modes, interrupts and data transfer instructions of the target microprocessor and microcontroller to the maximum optimization level. Industrial Automation, consumer electronics, Robotics. Security Systems.

05	Installation and Configuring Operating Systems (CP08310T) Understanding File systems and Memory Management.	Familiarize the concepts of different operating systems. Identify the services provided by the design of an operating system. Interpret the structure and organization of the file system. Explain how processes synchronized and scheduled. Identify different approaches to memory management. Explain File System Management and Disk Scheduling Algorithms	User interface, Memory management, File management, Process Scheduling. Device management, Security, Networking. Methods for handling Deadlocks.	Operating system administration. System programming. Improve the efficiency of CPU by applying CPU Scheduling algorithms. Apply various Deadlock methods in real time and use the resources efficiently.
06	Software Engineering (CP08406T) Understanding software process models, Architectural styles, Analysing, maintaining software.	Knowledge on Software Development Life Cycle. Software Design process & principles. Compare various software process models. Different methods of Testing Explain different software measurement and metrics	Analyse, design and maintain software. Relate the software architectural styles, techniques, models to suitable applications.	Apply the basic software engineering methods and practices and develop different types of application. Build the requirements document by understanding the application. Prepare Software Requirement Specification for real time applications.
07	Java Programming (CP08407T) Java Programming lab (CP08413P) Understanding and working with oops concept's, Java applets and implementing GUI.	Understand Java concepts. Packages & Interfaces. Exception handling, Multithreading. Work with java applets and implement GUI.	Familiarize the basics of Java. Implement java program by using OOP's Concepts. Create and deploy packages & Interfaces.	Use Java concepts to develop Mobile Applications Build a Desktop GUI application, Web development. Use java programming for Artificial Intelligence and Big Data Technologies, Embedded Systems.

			Implement and understand the collection framework. Implement multithreading concepts.	Debugging and testing.
08	Windows Server Administration and Linux Server Administration (CP08408T) Windows Server Administration and Linux Server Administration Lab (CP08412P) Understanding Server Administration and System Administration for Windows as well as Linux.	Identify different Server Roles in Windows Server 2012R2. Understand Active Directory, Permissions, Domain name System. Identify the different Roles in Linux Server. Explain steps involved in Server Administration and System Administration.	Install and configure different Server Roles in Windows Server 2012R2 and Linux Server. Active Directory Management, Security Virtualization, Networking, Disaster recovery Shell Scripting in Linux, Cloud Administration.	Work as a Server Administrator and System Administrator in Industry. Manage Windows and Linux Servers- Database servers, Cloud servers. Remote Desktop Services. Back Up and recovery.
09	IoT (CP08409T) IoT lab (CP08414P) Understanding IoT Architecture, Cloud computing and their applications	List Arduino hardware, software features. Explain the working of development board with peripherals and sensors. Familiarize protocols for wired and wireless communication. Explain the working of Intel Up square board with real time application in cloud environment. Build an application with Intel IoT kit. Task oriented shell scripts.	Understanding of IoT and IIoT technologies. Familiarize with basics of Arduino boards, understanding interfacing of various types of Sensors with Arduino for real time applications. Familiarize WI-FI applications with NODE MCU boards Understanding MQTT concepts with real time projects. Data analysis and visualization. Programming skills. Communication skills.	Develop real time IoT based project using Intel up square board. Develop an application using raspberry Pi in cloud platform. Build an application with Intel IoT kit. Capable of creating task-oriented shell scripts. Domain-specific knowledge in fields such as manufacturing, transportation, healthcare, and agriculture.

10	Web programming (Java Script, Perl, PHP, Python) (CP08410T) Web programming (Java Script, Perl, PHP, Python) Lab (CP08411P) Understanding Web development using different scripting languages.	Understand and familiarize yourself with JavaScript. Scripting Languages PHP, Perl. Knowledge on python Django framework	Perform different JavaScript programs. Implement Django web framework features. Writing and debugging JavaScript code. Manipulating HTML and CSS through the Document Object Model (DOM). Understanding of Server-Side Scripting languages PHP, PERL. Using PHP-Database Management, Problem-Solving and Debugging, Collaboration and Teamwork, collaboration and Teamwork	Implementing client-side form validation and user authentication using JavaScript. Creating dynamic and interactive web pages-Web Development. Using JavaScript libraries and frameworks, Desktop Applications, Server-Side Development, IoT, Machine Learning. Data Manipulation, System Administration, Text Processing, Networking using Perl. Develop Content Management system, Data Analytics, APIs using Django web framework
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11	Employability Skills (CP08315T) Employability Skills (CP08415T) 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 of 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, 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.	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 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.
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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