Fastrack Institute of IT and Computer Science Engineering

Accredited Center of

राष्ट्रीय इलेक्ट्रॉनिकी एवं सूचना प्रौद्योगिकी संस्थान

National Institute of Electronics & Information Technology

Department of Ministry of Electronics and Information Technology, Govt of India

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Information Booklet cum Syllabus

Of

'O' Level (IT)

Course Under NIELIT

National Institute of Electronics & Information Technology (NIELIT)

Department of Ministry of Electronics and Information Technology Govt of India

NIELIT O Level (IT) course is a government-recognized, one-year computer Diploma program that equips students with essential IT skills, opens up career opportunities in both government and private sectors, and serves as a stepping stone for advanced NIELIT certifications

Name of Course	NIELIT O Level (Information Technology)
Duration	July or January
Registration	Registration is a pre-requisite for appearing in 'O' Level (IT) examinations. Candidate has to register with NIELIT through Approved Center Fastrack Institute of IT and CSE Situated At Hawal Srinagar 190011, J&K . Registration will be valid for 5 years. Registration fee is Rs 500/-
Eligibility Criteria	12th Or Students registered through O-Level Accredited Institutes: ITI Certificate (Two Years) after class 10 Or ITI Certificate (One Years) after class 10 with one year of experience post qualification. Or Successful completion of the second year of a Government recognized polytechnic engineering diploma course after class 10, Training of 'O' Level course concurrently during the third year of the said 3 years Polytechnic engineering diploma course. The certificate of 'O' level will be awarded only after successful completion of the polytechnic engineering diploma. Or 10th pass and certification in the immediate previous NSQF Level Qualification in relevant field. Or Relevant Qualification of immediate previous NSQF Level with 2 Years of experience.
Objective of the 'O' Level Course	The objective of the course is to equip a student with necessary skills as per following job role. i. User Interface (UI) Designer ii. Web Designer iii. Web Publication Assistant iv. Office Automation Assistant v. IoT Application Integrator vi. Network Associate Engineer
Practical Examinations:	There is one practical paper for NIELIT "O" Level Course. Students need to provide the option for appearing in practical examination while filling up examination form. The

	practical examination is based on the syllabus of M1-R5, M2-R5, M3-R5 and M4-R5 modules. Duration of each practical examination is 3 hrs. Practical Examination fee is Rs 500/- .
Project Work	'O' Level (IT) courses has a project as an important component. The project is carried out by the student under guidance and support of faculty. No marks are assigned for this, but Candidates are required to carry out the project successfully. Students who complete the project work submit a project completion certificate in the prescribed format for issuing pass certificate to NIELIT HQ.

Calculation of Credits Under NCVET Guild lines

Credit calculation based on **NCVET** guidelines i.e. 1 credit of 30hrs (both theory & practical's) is as under –

S. No	Module Code	Module Name	No. of Lecture Theory Hours	No. of Tutorial/ Practical /Project Hours	Total Credits
1	M1-R5.1	Information Technology Tools and Network Basics	**48**	**72**	**4**
2	M2-R5.1	Web Designing & Publishing	**48**	**72**	**4**
3	M3-R5.1	Programming and Problem Solving through Python	**48**	**72**	**4**
4	M4-R5.1	Internet of Things and its Application	**48**	**72**	**4**
5	PJ1-R5.1	Project		**60**	**2**
			Total Credits	**18**	

- **There would be no negative marking in theory examination.**
- The marks will be translated into grades, while communicating results to the candidates. No rounding takes place in the calculation of grades. The gradation structure is as given-

Pass Percentage	Grade
Failed	F
>= 50% to < 55%	D
>= 55% to < 65%	C
>= 65% to < 75%	B
>= 75% to < 85%	A
>=85%	S

- **Award of Certificates:** The students would be eligible for the award of 'O' Level (IT) certificate on successfully qualifying the Theory Examinations of all modules, Practical Examinations and the Project. The 'O' Level (IT) Certificate was recognized as equivalent to Foundation Level Course by the Government of India for the purpose of employment vide Notification No. 43 & 49 dated 1st March, 1995 and 10th April, 1996 issued by the Ministry of Human Resources and Development, Government of India and is currently aligned at NSQF (National Skill Qualifications Framework) level 4.

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Module: M1-R5
Information Technology Tools and Network Basics

S. No	Module Unit	Marks	Theory	Practical
1	Introduction to Computer, Introduction to Operating System	10	8	12
2	Word Processing	20	6	9
3	Spreadsheet	20	8	12
4	Presentation	20	6	9
5	Introduction to Internet and WWW, E-mail, Social Networking and e-Governance Services	20	12	18
6	Digital Financial Tools and Applications, Overview of Futureskills & Cyber Security	10	8	12
	Total	**100**	**48**	**72**

1. **Introduction to Computer** : Computer and Latest IT gadgets, Evolution of Computers & its applications, IT gadgets and their applications, Basics of Hardware and Software, Central Processing Unit, Input devices, Output devices, Computer Memory & storage, Application Software, Systems Software, Utility Software, Open source and Proprietary Software, Mobile Apps.

2. **Introduction to Operating System** : Operating System, Basics of Operating System, Operating Systems for Desktop and Laptop, Operating Systems for Mobile Phone and Tablets, User Interface for Desktop and Laptop, Task Bar, Icons & shortcuts, running an application, Operating System simple setting, using mouse and changing its properties, changing system date and time, changing display properties, to add or remove Program and its features, adding, removing &sharing Printers, File and Folder management, types of file extensions.

3. **Word Processing** Word Processing Basics, Opening Word Processing Package, Title Bar, Menu Bar, Toolbars & Sidebar, Creating a New Document, Opening and Closing Documents, Opening Documents, Save and Save As, Closing Document, Using The Help, Page Setup, Page Layout, Borders, Watermark, Print Preview, Printing of Documents, PDF file and Saving a Document as PDF file, Text Creation and manipulation, Document Creation, Editing Text, Text Selection, Cut, Copy and Paste, Font, Color, Style and Size selection, Alignment of Text, Undo & Redo, AutoCorrect, Spelling & Grammar, Find and Replace, Formatting the Text, Creating and using user defined Styles, Paragraph Indentation, Bullets and Numbering, Change case, Header & Footer, Table Manipulation, Insert & Draw Table, Changing cell width and height, Alignment of Text in cell, Delete / Insertion of Row, Column and Merging & Splitting of Cells, Border and Shading, Mail Merge, Table of Contents, Indexes, Adding Comments, Tracking changes, Macro

4. **Spreadsheet** : Elements of Spread Sheet, Creating of Spread Sheet, Concept of Cell Address [Row and Column] and selecting a Cell, Entering Data [text, number, date] in Cells, Page Setup, Printing of Sheet, Saving Spreadsheet, Opening and Closing, Manipulation of Cells & Sheet, Modifying / Editing Cell Content , Formatting Cell (Font, Alignment, Style), Cut, Copy, Paste & Paste Special, Changing Cell Height and Width, Inserting and Deleting Rows, Column, AutoFill, Sorting & Filtering, Freezing panes, Formulas, Functions and Charts, Using Formulas for Numbers (Addition, Subtraction, Multiplication & Division), AutoSum, Functions (Sum, Count, MAX, MIN, AVERAGE),Sort, Filter, Advanced Filter, Database Functions (DSUM, DMIN,DMAX, DCOUNT, DCOUNTA), What-if Analysis, Pivot table Charts (Bar, Column, Pie, Line), Data Validation.

5. **Presentation** : Creation of Presentation, Creating a Presentation Using a Template, Creating a Blank Presentation, Inserting & Editing Text on Slides, Inserting and Deleting Slides in a Presentation, Saving a Presentation, Manipulating Slides, Inserting Table , Adding Pictures, Inserting Other Objects, Resizing and

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Scaling an Object, Creating & using Master Slide, Presentation of Slides , Choosing a Set Up for Presentation, Running a Slide Show, Transition and Slide Timings, Automating a Slide Show, Providing Aesthetics to Slides & Printing, Enhancing Text Presentation, Working with Color and Line Style, Adding Movie and Sound, Adding Headers, Footers and Notes, Printing Slides and Handouts

6. **Introduction to Internet and WWW** Basic of Computer Networks, Local Area Network (LAN), Wide Area Network (WAN), Network Topology , Internet, Concept of Internet & WWW, Applications of Internet, Website Address and URL, Introduction to IP Address, ISP and Role of ISP, Internet Protocol, Modes of Connecting Internet (HotSpot, Wifi, LAN Cable, BroadBand, USB Tethering), Identifying and uses of IP/MAC/IMEI of various devices, Popular Web Browsers (Internet Explorer/Edge, Chrome, Mozilla Firefox, Opera etc.), Exploring the Internet , Surfing the web, Popular Search Engines, Searching on Internet, Downloading Web Pages, Printing Web Pages

7. **E-mail, Social Networking and e-Governance Services :** Structure of E-mail, Using E-mails, Opening Email account, Mailbox: Inbox and Outbox, Creating and Sending a new E-mail, Replying to an E-mail message, Forwarding an E-mail message, Searching emails, Attaching files with email, Email Signature, Social Networking & e-Commerce, Facebook, Twitter, LinkedIn, Instagram, Instant Messaging (Whtsapp, Facebook Messenger, Telegram), Introduction to Blogs, Basics of E-commerce, Netiquettes, Overview of e-Governance Services like Railway Reservation, Passport, eHospital [ORS], Accessing e Governance Services on Mobile Using "UMANG APP", Digital Locker

8. **Digital Financial Tools and Applications** : Digital Financial Tools, Understanding OTP [One Time Password]and QR [Quick Response] Code, UPI [Unified Payment Interface], AEPS [Aadhaar Enabled Payment System], USSD [Unstructured Supplementary Service Data], Card [Credit / Debit], eWallet, PoS [Point of Sale], Internet Banking, National Electronic Fund Transfer (NEFT), Real Time Gross Settlement (RTGS), Immediate Payment Service (IMPS), Online Bill Payment

9. **Overview of Futureskills and Cyber Security** Introduction to Internet of Things (IoT), Big Data Analytics, Cloud Computing, Virtual Reality, Artificial Intelligence, Social & Mobile, Blockchain Technology, 3D Printing/ Additive Manufacturing, Robotics Process Automation, Cyber Security, Need of Cyber Security, Securing PC, Securing Smart Phone

Reference Books/Study Material

1. LibreOffce, Getting Started Guide by LibreOffice Documentation Team
2. Computer Networking by EdTittel,McGRaw Hills Companies
3. OpenOffice.org for DUMMIES by GurdyLeete, Ellen Finkelstein and Mary Leete

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Module (M2-R5.1)
Web Designing and Publishing

This module is designed to start web designing, irrespective of knowledge currently the students have in this area. The businesses, nowadays, are heavily relying on web based applications. The purpose of this module is to provide skill to students in designing layouts of web sites. By the end of this module, students will be able to describe the structure and functionality of the World Wide Web, create web pages using a combination of HTML, CSS, and JavaScript and Angular JS. The students will also learn how to design and integrate multimedia objects in web site. Further, the student will learn how web sites are published.

1. **Duration 120 Hours - (Theory: 48hrs + Practical: 72 hrs)**

Module Unit	Marks	Theory	Practical
Introduction to Web Design and Editors, HTML Basics	25	14	21
Cascading Style Sheets (CSS)	20	10	15
CSS Framework	15	6	9
JavaScript and Angular Js	20	10	15
Photo Editor, Web Publishing and Browsing	20	8	11
Total	**100**	**48**	**71**

Detailed Syllabus

1. **Introduction to Web Design** Introduction of Internet, WWW, Website, Working of Websites, Webpages, Front End, Back End, Client and Server Scripting Languages, Responsive Web Designing, Types of Websites (Static and Dynamic Websites).

2. **Editors** Downloading free Editors like Notepad++, Sublime Text Editor, making use of Editors, File creation and editing, saving.

3. **HTML Basics** HTML: Introduction, Basic Structure of HTML, Head Section and Elements of Head Section, Formatting Tags: Bold, Italic, Underline, Strikethrough, Div,Pre Tag Anchor links and Named Anchors Image Tag, Paragraphs, Comments, Tables: Attributes (Border, Cellpadding, Cellspacing , height , width), TR, TH, TD, Rowspan, Colspan Lists : Ordered List , Unordered List , Definition List, Forms, Form Elements, Input types, Input Attributes, Text Input Text Area, Dropdown, Radio buttons , Check boxes, Submit and Reset Buttons Frames: Frameset, nested Frames. HTML 5 Introduction, HTML5 New Elements: Section, Nav, Article, Aside, Audio Tag, Video Tag, HTML5 Form Validations: Require Attribute, Pattern Attribute, Autofocus Attribute, email, number type, date type, Range type, HTML embed multimedia, HTML Layout, HTML Iframe

4. **CSS** Introduction to CSS, Types of CSS, CSS Selectors: Universal Selector, ID selector, Tag Selector, Class Selector, Sub Selector, Attribute Selector, Group Selector, CSS Properties: Back Ground properties, Block Properties, Box properties, List properties, Border Properties, Positioning Properties, CSS Lists CSS Tables, CSS Menu Design CSS Image Gallery, Syllabus Revision 5.

5. **CSS Framework** Web Site Development using W3.CSS Framework, W3.CSS Intro, W3.CSS Colors, W3.CSS Containers, W3.CSS Panels, W3. CSS Borders, W3.CSS Fonts, W3.CSS Text, W3.CSS Tables, W3.CSS List, W3.CSS Images, W3.CSS Grid

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6. **JavaScript and Angular JS** Introduction to Client Side Scripting Language, Variables in Java Script, Operators in JS, Conditions Statements, JS Popup Boxes, JS Events, Basic Form Validations in JavaScript. Introduction to Angular JS: Expressions, Modules and Directives.

7. **Photo Editor** Features of Photo Editing: Tools: Selection Tools, Paint Tools, Transform Tools, Text Tool, Layers, Brightness/ Contrast, Improve Colors and tone, Filters.

8. **Web Publishing and Browsing** Overview, SGML (Standard Generalized Markup Language), Web hosting Basics, Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design Considerations and Principles, Search and Meta Search Engines, WWW, Browser, HTTP, Publishing Tools.

Reference Books/Study Material

1. HTML5, Black Book, Kagent Learning Solution Inc, 2014
2. Mastering HTML, CSS &JavaScript Web Publishing by Lemay Laura, BPB publications
3. HTML & CSS: The Complete Reference by Thomas Powell
4. Web Design, McGraw –hill
5. Learning Angular JS by Brad Dayley, Pearson

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Module (M3-R5.1)
Programming and Problem Solving Through Python Language

Introduction to Module Python is easy to use, powerful and versatile programming language, making it a great choice for developers. Python is used widely in different areas likes building Raspberry Pi applications, writing script program for desktop applications, configuring servers, developing machine learning& data analytics applications and developing web applications.

120 Hours - (Theory: 48hrs + Practical: 72 hrs)

S. No	Module Unit	Written Marks (Max.)	Theory Duration Hrs	Practical Hrs
1	Introduction to Programming, Algorithm and Flowcharts to solve problems	20	8	11
2	Introduction to Python, Operators, Expressions and Python Statements, Sequence data types	30	16	27
3	Functions, File Processing, Modules	40	20	28
4	NumPy Basics	10	4	6
	Total	100	46	71

Detailed Syllabus

1. **Introduction to Programming**: The basic Model of computation, algorithms, flowcharts, Programming Languages, compilation, testing & debugging and documentation.

2. **Algorithms and Flowcharts to Solve Problems** Flow Chart Symbols, Basic algorithms/flowcharts for sequential processing, decision based processing and iterative processing. Some examples like: Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, reversing digits of an integer, GCD (Greatest Common Divisor) of two numbers, Test whether a number is prime, factorial computation, Fibonacci sequence, evaluate 'sin x' as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, etc.

3. **Introduction to Python Python** Introduction, Technical Strength of Python, Introduction to Python Interpreter and program execution, Using Comments, Literals, Constants, Python's Built-in Data types, Numbers (Integers, Floats, Complex Numbers, Real, Sets), Strings (Slicing, Indexing, Concatenation, other operations on Strings), Accepting input from Console, printing statements, Simple 'Python' programs.

4. **Operators, Expressions and Python Statements** Assignment statement, expressions, Arithmetic, Relational, Logical, Bitwise operators and their precedence, Conditional statements: if, if-else, if-elif-else; simple programs, Notion of iterative computation and control flow –range function, While Statement, For loop, break statement, Continue Statement, Pass statement, else, assert.

5. **Sequence Data Types** Lists, tuples and dictionary, (Slicing, Indexing, Concatenation, other operations on Sequence data type), concept of mutability, Examples to include finding the maximum, minimum, mean; linear search on list/tuple of numbers, and counting the frequency of elements in a list using a dictionary.

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6. **Functions** Top-down approach of problem solving, Modular programming and functions, Function parameters, Local variables, the Return statement, Doc Strings, global statement, Default argument values, keyword arguments, VarArgs parameters. Library function-input(), eval(),print(), String Functions: count(), find(), rfind(), capitalize(), title(), lower(), upper(), swapcase(), islower(), isupper(), istitle(), replace(), strip(), lstrip(), rstrip(), aplit(), partition(), join(), isspace(), isalpha(), isdigit(), isalnum(), startswith(), endswith(), encode(), decode(), String: Slicing, Membership, Pattern Matching, Numeric Functions: eval(), max(), min(), pow(), round(), int(), random(), ceil(), floor(), sqrt(), Date & Time Functions, Recursion.

7. **File Processing** Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file, File functions-open (), close (), read (), readline(), readlines(), write(), writelines(),tell(),seek(), Command Line arguments.

8. **Scope and Modules** Scope of objects and Names, LEGB Rule Module Basics, Module Files as Namespaces, Import Model, Reloading Modules.

9. **NumPy Basics** Introduction to NumPy ndarray, datatypes, array attributes, array creation routines, Array From Existing Data, Array From Numerical Ranges, Indexing & Slicing.

Reference Books/Study Material

1. Python Programming- A Modular Approach (with Graphics, database, Mobile and Web Applications by Sheetal Taneja and Naveen Kumar, Pearson
2. Python Network Programming Cookbook by Pradeeban Kathiravelu, Dr. M. O. Faruque Sarkar, PACKT. 3
3. Head First Python by Paul Berry, O'Reilly
4. Dive into Python by Mark Pilgrim, APress
5. Beginning Programming with Python Dummies by John Paul Meuller.

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Module 4:

Internet of Things and its Applications (M4-R5.1)

The module is designed to equip the students to understand the basics of connected world that is Internet of Things (IoT) and its applications. IoT primarily refers to the connected and smarter world having physical and virtual objects with some unique identities. IoT applications span across domains of industrial control, retail, energy, agriculture, etc. This module provides the theoretical and practical aspects of interfacing sensors and actuators, making informed world of Things speaking to each other. The different type of communication modes and models are discussed in detail. The in-depth knowledge of software and packages is provided to make applications in IoT paradigm.

Duration 120 Hours - (Theory: 48hrs + Practical: 72 hrs)

Module Unit	Marks	theory	Practical
1. Introduction to IoT – Applications/Devices, Protocols and Communication Model	**10**	**4**	**6**
2. Things and Connections	10	4	6
3. Sensors, Actuators and Microcontrollers	15	8	12
4. Building IoT Applications	40	20	30
5. Security and Future of IoT Ecosystem	5	4	6
6. Soft skills-Personality Development	20	8	12
Total	100	48	72

Detailed Syllabus

1. **Introduction to Internet of Things – Applications/Devices, Protocols and Communication Model**
   Introduction - Overview of Internet of Things(IoT), the characteristics of devices and applications in IoT ecosystem, building blocks of IoT, Various technologies making up IoT ecosystem, IoT levels, IoT design methodology, The Physical Design/Logical Design of IoT, Functional blocks of IoT and Communication Models, Development Tools used in IoT.

2. **Things and Connections** Working of Controlled Systems, Real-time systems with feedback loop e.g. thermostat in refrigrator, AC, etc. Connectivity models – TCP/IP versus OSI model, different type of modes using wired and wireless methodology, The process flow of an IoT application.

3. **Sensors, Actuators and Microcontrollers Sensor :** Measuring physical quantities in digital world e.g. light sensor, moisture sensor, temperature sensor, etc. Actuator – moving or controlling system e.g. DC motor, different type of actuators , Controller – Role of microcontroller as gateway to interfacing sensors and actuators, microcontroller vs microprocessor, different type of microcontrollers in embedded ecosystem.

4. **Building IoT applications Introduction to Arduino** IDE – writing code in sketch, compiling-debugging, uploading the file to Arduino board, role of serial monitor. Embedded 'C' Language basics - Variables and Identifiers, Built-in Data Types, Arithmetic operators and Expressions, Constants and Literals, assignment. Conditional Statements and Loops - Decision making using Relational Operators, Logical Connectives - conditions, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement. Arrays – Declaring and manipulating single dimension arrays Functions - Standard Library of C functions in Arduino IDE, Prototype of a function: Formal parameter list, Return Type, Function call. Interfacing sensors – The working of digital versus analog pins in Arduino platform, interfacing LED, Button, Sensors-DHT, LDR, MQ135, IR. Display the data on Liquid Crystal Display (LCD), interfacing keypad Serial communication – interfacing HC-05(Bluetooth module) Control/handle 220V AC supply – interfacing relay module.

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5. **Security and Future of IoT Ecosystem**
   Need of security in IoT - Why Security? Privacy for IoT enabled devices- IoT security for consumer devices- Security levels, protecting IoT devices

   Future IoT eco system - Need of power full core for building secure algorithms, Examples for new trends - AI, ML penetration to IoT

6. **Soft skills-Personality Development**

Reference Books/Study Material

1. Macro Schwartz, “Internet of Things with Arduino- Cookbook”, Packt 2016
2. Arshdeep Bajga and Vijay Madisetti, “Internet of Things- A Hands-on Approach” Universities Press, 2014
3. Massimo Banzi, “Getting started with Arduino”, 2nd Edition, Oreilly, 2011 [Make:Makezine.com]
4. Macro Schwartz, “Internet of Things with Arduino”, Open Home Automation
5. Michael Margolis, “Arduino Cookbook”, Oreilly, 2011

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