

### 1. ‘O’ LEVEL COURSE

#### 1.1. 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

#### 1.2. Structure of NIELIT ‘O’ Level Course

DOEACC ‘O’ Level Course consists of four compulsory theory modules, one practical and one Project. The structure of the ‘O’ Level syllabus is indicated below:-

Module Code	Module	Learning Hours (Theory)	Learning Hours (Practical/ Tutorials/ Project)	Total Learning Hours
M1-R5	Information Technology Tools and Network Basis	48	72	120
M2-R5	Web Designing & Publishing	48	72	120
M3-R5	Programming and Problem Solving through Python	48	72	120
M4-R5	Internet of Things and its Applications	48	72	120
M5-R5	Practical based on M1-R5, M2-R5, M3-R5 and M3-R5			
M6-R5	Project		40	40
	Total	192	328	520

#### 1.3. Duration of the Course

The duration of DOEACC ‘O’ level course is 520 hours and the minimum period to cover contents is **Six Months**.

### 2. PRACTICAL

The students have to devote 60% of the total time allotted to each module of the course for the practical sessions. Practical assignments have been worked out for each theory module. The Practical examination will be based on the syllabi M1-R5, M2-R5, M3-R5 and M4-R5 modules of ‘O’ Level course.

### 3. PROJECT

DOEACC curriculum has a project as an important component of 'O' Level course. The Project is carried out by the student under guidance and support of faculty and management of the respective Institute / Organization. It is felt that such a project provides an opportunity to the student to apply his / her knowledge and skills to real life problems (including oral and written communication skills), and as such the project should be given utmost importance and priority both by the students as well as institution faculty / management in respect of its identification, planning and implementation.

#### 3.1. Objective of the Project

The objective of the project is to give the students an additional hand-on experience in solving a real life problem by applying knowledge and skills gained on completion of theory papers in a course at a given Level. It provides an opportunity to students to develop written and communication skills. Project also helps the students to realize the importance of resource and time management, ownership of task towards deliverables, innovation and efficiency in task management apart from presentation skills. It also provides a good opportunity for students to build, enhance and sustain high levels of professional conduct and performance and evolves a problem solver frame of mind in the students. It is also felt that taking up the project by a student prepares him for a job in industry and elsewhere.

#### 3.2. Project Submission

The student undergoing course 'O' level course has to submit project in order to be 'O' Level certified. The project should be original, of real life value and not copies from existing material from any other source.

The Learners are expected to carry out a project successfully and submit certificate in the prescribed format from the head of the institute running the accredited course or the organization of which the Learner is an employee. Proforma of the Project Completion Certificate is given as follow;

#### 4. CREDIT SCHEME FOR DOEACC 'O' LEVEL

##### 4.1. Course Introduction

A credit system based on the AICTE norms has been introduced for indicating the efforts required to pass a specific level of course under the DOEACC Scheme. Award of credit to a student will facilitate measurement/comparison of study hours including Theory Lectures, Tutorials and Practical Assignments put in a given module/paper/subject under the Scheme with similar course in IT in India and abroad. This will also facilitate other Universities/ Apex Accrediting bodies to consider academic and professional equivalence of DOEACC courses. This will also help students/organizations to transfer credits from DOEACC to other academic bodies and vice-versa for ensuring continuing education. Following table gives the number of hours of Lectures/Tutorials and Practicals per week to be attended and the credits earned by the student:-

##### 4.2. Calculation of Credits

Sr. No.	Module Code	Module Name	No. of Lecture per week (L)	No. of Tutorial/ Practical per week (T+P)	Total Credit L +(T+P)/2
1.	M1-R5	Information Technology tools and Network Basis	2	4	4
2.	M2-R5	Web Designing & Publishing	2	4	4
3.	M3-R5	Programming and Problem Solving through Python	2	4	4
4.	M4-R5	Internet of Things and its Application	2	4	4
5.	M6-R5	Project		2	1
6.		<b>Total Credits</b>			<b>17</b>

##### Notes

- One credit is defined as one hour of lecture and 2 hours of tutorials/ practical every week for one semester consisting of 20 weeks.
- Total number of credits earned in a module is calculated using AICTE formula (as applicable to Under Graduate Courses in IT namely  $C=L + (T+P)/2$  where L, T and P indicate number of hours per week for Lectures, Tutorials and Practicals.
- The credit scheme was implemented from July, 2003 examinations.
- Fractions in Credits have been rounded to nearest integer.

## 5. EXAMINATION PATTERN

The theory examination for each module under the fifth revised syllabus would be for duration of three hours and the total marks for each subject would be 100. One Practical examination of three hours duration and would be of 100 marks. The first examination with the revised syllabus will be held in January 2020, for which teaching will commence with immediate effect.

Dates for the various activities connected with examinations will be announced on NIELIT website, well in advance of the examinations.

Laboratory/ Practical work will be conducted at Institutions / organizations, which are running the course. NIELIT will be responsible for holding the examination for theory and practical both for the students from Accredited Centers and student at large.

### 5.1. Pass Percentage

To qualify for a pass in a module, a candidate must have obtained at least 50% in each theory, practical examination and project. Following table shows the marks distribution

Module Code	Module	Maximum Marks
M1-R5	Information Technology tools and Network Basis	100
M2-R5	Web Designing & Publishing	100
M3-R5	Programming and Problem Solving through Python	100
M4-R5	Internet of Things and its Applications	100
M5-R5	Practical based on M1-R5, M2-R5, M3-R5 and M4-R5	100
M6-R5	Project (Certificate only to qualify O Level)	-
	Total Maximum Marks	500

The marks will be translated into grades, while communicating results to the candidates. The gradation structure is as below:-

Pass Percentage	Grade
Failed (<50)	F
50%-54%	D
55%-64%	C
65%-74%	B
75%-84%	A
85% and over	S

### 5.2. Award of Certificates

The students would be eligible for the award of 'O' Level certificate on successfully qualifying the Theory Examinations of all modules, Practical Examination and the Project. The 'O' Level 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 1<sup>st</sup> March, 1995 and 10<sup>th</sup> April, 1996 respectively issued by the Ministry of HRD, Government of India.

### 5.3. Registration

Registration is a pre-requisite for appearing in 'O' Level examinations. A candidate can register at only one Level at a time to appear for the examination. Registration is only for candidates and not for institutes. Candidate has to register with NIELIT through online portal.

### 5.4. Eligibility Criteria

The eligibility criteria for registration at 'O' Level is as follows:

#### 5.4.1. Students from Institutes conducting accredited courses:

10+2 or ITI Certificate (One Year) after class 10 followed in each case, by an accredited 'O' Level course.

Or

Successful completion of the second year of a Government recognized polytechnic engineering diploma course after class 10, followed by an accredited 'O' Level course concurrently during the third year of the said polytechnic engineering diploma course. The certificate of 'O' level will be awarded only after successful completion of the polytechnic engineering diploma.

#### 5.4.2. Direct Applicants

10+2 or ITI Certificate (One Year) after class 10, followed in each case, by one-year relevant experience. Relevant experience connotes job experience in IT, including teaching in a recognized institution as a faculty member, excludes coaching.

Or

A pass in the NCVT-DP&CS (data Preparation & Computer Software) Examination, conducted by DGE&T(Govt. of India)

For getting registered, a candidate fulfilling the eligibility criteria should apply online in NIELIT portal. Registration fee is also to be paid online. Registration fee once paid is not reimbursable or adjustable against any other payment.

Registration application can be submitted online throughout the year, however cut off dates are specified for submitting Registration applications for each examinations for the convenience of processing and allotting Registration Numbers.

Cut off Dates	
<b>January Examination</b>	<b>July Examination</b>
Preceding 30 <sup>th</sup> June	Preceding 31 <sup>st</sup> December

Accredited Institutes are allowed to submit the Registration Application Form online of their candidates one month beyond the cut off dates.

### 5.5. Auto-upgradation:

The candidates successfully completing all papers (Theory, Practical and Project) of a particular Level in a particular Examination and wish to appear in the next Examination for immediate higher Level are exempted from the above cut off dates. Such candidates can fill up examinations Form and Registration Forms for higher Levels subject to following conditions:-

- Combined Registration fee and Examination fee is paid online.
- The facility is available to the candidates appearing through Accredited Institutes and not for direct applicants. However the facility is available to a candidate who might have completed lower level as a direct candidate and wishing to appear for immediate higher level through Accredited Institutes.
- The facility is also not available to the candidates those who might be appearing through Accredited institute but have cleared lower level prior to the preceding exam (e.g. if a candidate has passed 'O' Level Exam in Jan, 2019, he would be eligible for this facility in case he wishes to appear for 'A' Level Examinations in July, 2019 through Accredited Institute. If, however, he had passed 'O' Level prior to Jan., 2019 Exams, this facility would not be available to him).
- This facility would also not be available to the candidate opting for Level jumping (e.g. from 'O' to 'B' or 'A' to 'C' Levels).

Once registered at a particular level, the registration is valid for ten consecutive examinations for 'O' Level, reckoned from the specific examination as indicated in the Registration allocation letter issued to the candidates.

Registration, by itself, does not entitle a candidate to appear for an examination at the Level concerned, unless all conditions, stipulated in the examination application form, and in any other notification, relevant to the examination are fulfilled by the candidate.

### 5.6. Re-registration:

Candidates who are not able to clear the level within the validity period of initial registration, are allowed to re-register for once, at the same level for another full term i.e. 5 years to clear the left over papers by submitting filled in Registration application and full Registration fee within one year of the expiry of the validity period of existing Registration.

## 6. PRACTICAL EXAMINATION SCHEME

The Practical Examination will be conducted by the NIELIT in reputed Institutions for all candidates. The institutes are obliged to facilitate the conduct of Practical Examinations and arrange infrastructure, support of its faculty and staff for the conduct of Practical Examination at their Centre. The practical examination scheme is as follows.

Number of Practical Examination	One
Duration of Practical Examination	Three hour duration including viva-voce

Max. Marks	100 = 80(Practical) + 20(Viva Voce)
Grading	Marks obtained by the students will be translated into the Grades as per the structure given Section 9.1.
Date(s)	Date(s) will be announced on NIELIT website.

The institutes are not allowed to charge any fee from the candidates, for the practical examination

## 7. HARDWARE REQUIREMENT FOR 'O' LEVEL COURSE

### 7.1. Computer configuration recommended

Processor	:	1 GHz or higher
RAM	:	1 GB or higher
HDD	:	100 GB or higher
Monitor	:	SVGA
Mouse	:	Windows compatible
Keyboard	:	Standard
NIC	:	Standard
Optical Drive	:	Standard
Speaker, Mic, Webcam	:	Standard
CD/DVD Writer	:	Standard

### 7.2. Printer

Laser printer / Inkjet Printer	:	Standard
Dot matrix printer	:	Standard
OHP /LCD Projector	:	Standard
MODEM, DIAL UP/DSL	:	Standard
SCANNER	:	Standard

Sufficient number of computers are standard networking are part of satisfying criteria for accreditation.

### 7.3. Networking

NIC	:	Standard
RJ-45 Connector	:	Standard
Crimping Tools	:	Standard
UTP/STP/Coaxial Fiber Optic	:	Standard
Cables and their connectors	:	Standard
8/16 port Hub/Switch	:	Standard
Wi-H Router	:	Standard

#### 7.4. Others

Arduino UNO or equivalent board sensors and motors

### 1. SOFTWARE REQUIREMENT FOR 'O' LEVEL COURSE

Sr. No.	Particular	Software
1.	Operating System	Linux/Windows/Unix
2.	NOS	Linux/Windows/Unix
3.	Software Package	LibreOffice, Star Office/ MS Office or any relevant word processing/spreadsheet
4.	Compiler/Interpreter	Python
5.	Antivirus	Standard
6.	Internet and Web Publishing Tools	Standard Browser and publishing tools
7.	IoT	Arduino IDE Ardublockopen Tool

### 2. PARITY TABLE BETWEEN REVISION IV and REVISION V of 'O' LEVEL SYLLABUS

Module Code (Revision IV)	Revision IV (Module)	Module Code (Revision V)	Revision V (Module)
M1-R4	IT Tools and Business System	M1-R5	Information Technology tools and Network Basis
M2-R4	Internet Technology and Web Design	M2-R5	Web Designing & Publishing
M3-R4	Programming and Problem Solving Through 'C' Language	M1-R5	Programming and Problem Solving through Python
M4.1-R4	Application of .NET Technology	M1-R5	Internet of Things and its Applications
M4.2-R4	Introduction to Multimedia		
M4.3-R4	Introduction to ICT Resources		

- The above table shows the equivalence between the modules of old syllabus (Revision VI and V).
- Candidates would not be allowed to appear in the equivalent papers of the Revision IV (new syllabus), if they have already passed the relevant papers in earlier revision.
- Candidates would have to pass a total of 4 papers and one practical in order to qualify 'O' Level in Revision IV syllabus.



4. In case, candidate has cleared examination as per Revision II and/or Revision III, the equivalency of Revision II with III and Revision III with IV will be done before the equivalency with Revision V is done.
5. Candidates would be allowed exemption in equal number of papers which they have passed in Revision II or Revision III (old syllabus).

Draft Syllabus O Level

## **Detailed Modules**

### **1. Module: M1-R5: IT Tools & Basics of Networks**

#### **1.1. Introduction**

The module is designed to equip a student to use computers for professional as well as day to day use. It provides theoretical background as well as in depth knowledge of Software/ packages.

#### **1.2. Objectives**

After completing the module, the incumbent will be able to:

- Acquire confidence in using computers in Office and General Life
- Identify the basic components of computers and terminology
- Understand file management
- Create documents using word processor, spreadsheet & presentation software
- Understand computer networks, and browse the internet, content search, email and collaborate with peers
- Use e-Governance applications; and use computer to improve existing skills and learn new skills
- Understanding Social Networking platform
- Using internet for Digital Financial services
- Develop knowledge about FutureSkills
- Understand the various financial services and be aware of the various schemes started by Government.

#### **1.3. Duration**

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

#### **1.4. Outline of Module**

<b>Module Unit</b>	<b>Duration (Theory) in Hours</b>	<b>Duration (Practical) in Hours</b>	<b>Learning Objectives</b>
<b>1. Introduction to Computer</b>	4	6	After completion of this unit of module, the Learner will be able to

			<ul style="list-style-type: none"> <li>• Identify computers, IT gadgets and explain their evolution and applications.</li> <li>• Get familiar with various input, output and hardware components of a computer along with storage devices.</li> <li>• Get familiar with various types of software, utilities used for computer and mobile apps.</li> </ul>
2. Introduction to Operating System	4	6	<p>After learning this unit, Learner will be:</p> <ul style="list-style-type: none"> <li>• Well acquainted with Operating System and its applications for both desktop and mobile devices.</li> <li>• Able to identify various desktop screen components and modify various properties, date, time etc.</li> <li>• Able to add and remove new program and features, manage files and folders.</li> <li>• Well versed with printing and know various types of file extensions.</li> </ul>
3. Word Processing	6	9	<p>After completion of this unit, Learner will have in depth knowledge of</p> <ul style="list-style-type: none"> <li>• Word Processing, their usage, details of word processing screen</li> <li>• Opening, saving and printing a document including pdf files</li> <li>• Document creation, formatting of text, paragraph and whole document</li> <li>• Inserting Header and Footer on the document</li> <li>• Finding text on a word document and correcting spellings</li> <li>• Inserting and manipulating</li> </ul>

			<p>tables, enhancing table using borders and shading features</p> <ul style="list-style-type: none"> <li>• Preparing copies of a document labels etc. for sending various recipients using Mail Merge.</li> </ul>
4. Spreadsheet	8	12	<p>After completion of this unit, Learner will have good hands-on practice on</p> <ul style="list-style-type: none"> <li>• Basic Knowledge of Spreadsheet Processing, their usage, details of Spreadsheet screen</li> <li>• Opening, saving and printing a Spreadsheet</li> <li>• Spreadsheet creation, inserting and editing data in cells, sorting and filtering of data</li> <li>• Inserting and deleting rows /columns</li> <li>• Applying basic formulas and functions</li> <li>• Preparing chart to represent the information in a pictorial form.</li> </ul>
5. Presentation	6	9	<p>After completion of this unit, Learner will have good hands-on practice on</p> <ul style="list-style-type: none"> <li>• Basic Knowledge of PowerPoint presentations.</li> <li>• Opening/saving a presentation and printing of slides and handouts</li> <li>• Manipulating slides to enhance the look of the slides as well as whole presentation by inserting a picture, objects, multimedia formatting etc.</li> <li>• Running a slide show with various transitions.</li> </ul>
6. Introduction to Internet and WWW	6	9	<p>After completion of this unit, Learner will be able to</p> <ul style="list-style-type: none"> <li>• Gather knowledge of various types of networks</li> </ul>

			<p>and topologies</p> <ul style="list-style-type: none"> <li>• Get an overview of Internet, its applications and various browsers available to access the Internet</li> <li>• Connect to Internet using various modes of connections/devices available</li> <li>• Get knowledge of device identification on local network as well as on Internet for both Desktop and Mobile Devices</li> <li>• Can search Information on the Internet on various topics</li> <li>• Download and print web pages.</li> </ul>
7. E-mail, Social Networking and e-Governance Services	6	9	<p>After completion of this unit, Learner will be able to</p> <ul style="list-style-type: none"> <li>• Create an email account, compose an email, reply an email and send the email along with attachments</li> <li>• Get familiar with Social Networking, Instant Messaging and Blogs</li> <li>• Get familiar with e-Governance Services, e-Commerce and Mobile Apps.</li> </ul>
8. Digital Financial Tools and Applications	4	6	<p>After completion of this unit, Learner will be able to</p> <ul style="list-style-type: none"> <li>• Know the Digital Financial Tools</li> <li>• Get Knowledge of Internet Banking Modes</li> <li>• Get familiar with e-Governance Services, e-Commerce and Mobile Apps</li> <li>• Use the Digital Locker and will be able to store documents in Digital Locker</li> </ul>

9. Overview of FutureSkills & Cyber Security	4	6	<p>After completion of this unit, Learner will be familiar with the</p> <ul style="list-style-type: none"> <li>• Latest trends and technologies in upcoming fields in IECT</li> <li>• Need of Cyber Security and will be able to secure their PC and Mobile devices by using basic security features.</li> </ul>
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### 1.5. Marks Distribution

Module Unit	Written Marks (Max.)
1. Introduction to Computer, Introduction to Operating System	10
2. Word Processing	20
3. Spreadsheet	20
4. Presentation	20
5. Introduction to Internet and WWW, E-mail, Social Networking and e-Governance Services	20
6. Digital Financial Tools and Applications, Overview of FutureSkills & Cyber Security	10
7. Total	100

### 1.6. Detailed Syllabus

#### (i) 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.

#### (ii) 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 Features, Adding, Removing & Sharing Printers, File and Folder Management, Types of file Extensions

### **(iii) 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

### **(iv) 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).

### **(v) 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 ClipArt Pictures, Inserting Other Objects, Resizing and 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

**(vi) 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

**(vii) 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 (Whatsapp, 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

**(viii) 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

**(ix) 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



## 2. Module: M2-R5: Web Designing & Publishing

### 2.1. Introduction to Module

This module is designed to start web designing, irrespective of knowledge currently 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, student 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 student will also learn how to design and integrate multimedia objects in web site. Further, the student will learn how web sites are published.

### 2.2. Objective

After completing the module, the incumbent will be able to:

- Design and create effective web pages
- Integrate graphics in web pages
- Integrate various tools and techniques like HTML, CSS, JavaScript etc.
- Design and edit images using tools
- Embed the images in web pages

### 2.3. Duration

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

### 2.4. Outline of Module

Module Unit	Duration (Theory) in Hours	Duration (Practical) in Hours	Learning Objectives
Introduction to Web Design	2	3	After completing this unit, learner will be able to <ul style="list-style-type: none"> <li>• Know the types of web site</li> <li>• Know the role of front end and back end application</li> <li>• Understand the concept of client side scripting and server side scripting</li> </ul>
Editors	2	3	After completing this unit, learner will be able to <ul style="list-style-type: none"> <li>• Difference editors available for writing code</li> <li>• Understand working of editors</li> </ul>

HTML Basis	10	15	After completing this unit, learner will be able to develop static website using different HTML Controls
Cascading Style Sheets (CSS)	10	15	After completing this unit, learner will be able to <ul style="list-style-type: none"> <li>• Purpose of CSS</li> <li>• Role of CSS in web sites</li> <li>• Enhancing the effects in web site</li> </ul>
CSS Framework	6	9	After completing this unit, learner will be able to use CSS Framework to develop web site effectively.
Javascript and Angular Js I	10	15	After completing this unit, learner will be able to <ul style="list-style-type: none"> <li>• Apply client side scripting</li> <li>• Adding Validations checks on forms (web pages)</li> </ul>
Photo Editor	6	9	After completing this unit, learner will be able to edit images and embed in web pages
Web Publishing and Browsing	2	3	The learner will finally be able to publish the web sites

## 2.5. Marks Distribution

Module Unit	Written Marks (Max.)
1 Introduction to Web Design and Editors, HTML Basis	25
3 Cascading Style Sheets (CSS)	20
4 CSS Framework	15
5 JavaScript and Angular Js I	20
6 Photo Editor, Web Publishing and Browsing	20
Total	100

## 2.6. Detailed Syllabus

### (i) Introduction to Web Design

Introduction of Internet, WWW, What is Website? How the Website Works?, Web pages, Front End, Back End, Client and Server Scripting Languages, Responsive Web Designing, Types of Websites (Static and Dynamic Websites)

### (ii) Editors

Notepad, Downloading free Editors: Notepad++, Sublime Text Editor, Making use of Editors, File creation and editing, saving

### (iii) HTML

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 ImageTag, 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

### (iv) 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,

### (v) 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

### (vi) 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

**(vii) Photo Editor**

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

**(viii) Web Publishing and Browsing**

Overview, SGML, Web hosting Basics, HTML, CGL, Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design Consideration and Principles, Search and Meta Search Engines, WWW, Browser, HTTP, Publishing Tools.

Draft Syllabus O Level

### 3. Module: M3-R5: Programming and Problem Solving through Python Language

#### 3.1. Introduction to Module

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

#### 3.2. Objectives

The objectives of this module are to make the beginners understand the programming language concepts like Data Types, Loops, Functions; Python Lists, Strings, Tuples, Dictionaries, Elementary Data Handling using Pandas, NumPy Arrays, Creating Forms etc.

After completion of this course the learner is expected to analyze the real life problem and write a program in Python to solve the problem. The main emphasis of the module will be on writing algorithm to solve problems and implement in Python. After completion of the module, the learner will be able to

- Draw flow charts for solving different problems
- Develop efficient algorithms for solving a problem
- Use the various constructs of Python viz. conditional, iteration
- Write programs making judicious use of Lists, Strings, Tuples, Dictionaries wherever required
- Manage data using Numpy
- Handle files and create Modules in Python

#### 3.3. Duration

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

#### 3.4. Outline of Module

Module Unit	Duration (Theory) in Hours	Duration (Practical) in Hours	Learning Objectives
1. Introduction to Programming	2	3	After completion of this unit of module, the candidate will be able to <ul style="list-style-type: none"> <li>• Understand the concept of Programming</li> <li>• Understand evolution of Programming.</li> </ul>

2. Algorithm and Flowcharts to solve problems	6	9	<p>After completion of this unit of module, the candidate will be able to</p> <ul style="list-style-type: none"> <li>• Understand the concepts and purposes of algorithm and flowchart</li> <li>• Use algorithm and flowchart to solve problem independent of language</li> <li>• Gain knowledge of different constructs of algorithm and flowchart.</li> </ul>
3. Introduction to Python	2	3	<p>After completion of this unit of module, the candidate will be able to</p> <ul style="list-style-type: none"> <li>• Understand features of Python that make it one the most popular languages in the industry</li> <li>• Understand structure of Python problem</li> <li>• Understand the areas where Python is used</li> </ul>
4. Operators, Expressions and Python Statements	10	15	<p>After completion of this unit of module, the candidate will be able to</p> <ul style="list-style-type: none"> <li>• Use the basic operators and expressions available in Python in developing program</li> <li>• Understand and use various Python statements like conditional constructs, looping constructs in writing Python program .</li> </ul>
5. Sequence data types	6	9	<p>After completion of this unit of module, the candidate will be able to</p> <ul style="list-style-type: none"> <li>• Work with various built-in Sequence datatypes and their use</li> <li>• Understand the concept of mutable and immutable objects</li> </ul>

6. Functions	10	15	After completion of this unit of module, the candidate will be able to <ul style="list-style-type: none"> <li>• Apply the in-built functions available in Python in solving different problems</li> <li>• Work with modular approach using user defined functions</li> </ul>
7. File Processing	6	9	After completion of this unit of module, the candidate will be able to <ul style="list-style-type: none"> <li>• Work with files and reading /writing onto files</li> </ul>
8. Modules	2	3	After completion of this unit of module, the candidate will be able to <ul style="list-style-type: none"> <li>• Understand the concept of modules and importing, loading and reloading of modules in programs.</li> </ul>
9. NumPy Basics	4	6	After completion of this unit of module, the candidate will be able to <ul style="list-style-type: none"> <li>• work on NumPy array manipulation to access data and subarrays and to split, reshape, join arrays etc</li> </ul>
Total	48	72	

### 3.5. Marks Distribution

Module Unit	Written Marks (Max.)
1. Introduction to Programming, Algorithm and Flowcharts to solve problems	20
2. Introduction to Python, Operators, Expressions and Python Statements, Sequence data types	30
3. Functions, File Processing, Modules	30
4. NumPy Basics	20

5. Total

100

### 3.6. Detailed Syllabus

#### (i) Introduction to Programming

The basic Model of computation, algorithms, flowcharts, Programming Languages, compilation, testing & Debugging and documentation.

#### (ii) 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 Division) 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.

#### (iii) 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.

#### (iv) 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.

#### (v) 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.

#### (vi) Functions

Top-down approach of problem solving, Modular programming and functions, Function parameters, Local variables, the Return statement, DocStrings, 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(), split(), 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

**(vii) 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.

**(viii) Scope and Modules**

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

**(ix) NumPy Basics**

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

Draft Syllabus

## Detailed Modules

### 4. Module: M4-R5: Introduction to Internet of Things(IoT) and its Applications

#### 4.1. Introduction

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 spans across domains of industrial control, retail, energy, agriculture, etc. According to experts forecast, IoT ecosystem will have 50 billion devices/things by 2020.

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.

#### 4.2. Objective

After completing the module, the incumbent will be able to:

- Understand how connected devices work together to update other applications
- Acquire knowledge to interface sensors and actuator with microcontroller based Arduino platform
- Writing C programs in Arduino IDE
- Understand the Communication between microcontroller and PC using serial communication
- Build IoT based applications and understand how data flows between things
- Understand how electronic devices control electrical appliances working at 220v AC
- Understand security aspect of IoT devices
- Enhance skill set towards better personality development

#### 4.3. Duration

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

#### 4.4. Outline of Module

Module Unit	Duration (Theory) in Hours	Duration (Practical) in Hours	Learning Objectives
1. Introduction to IoT –	4	6	After completion of this unit of module, the Learner will be

Applications/ devices, protocols, communication model			able to <ul style="list-style-type: none"> <li>• Understand various IoT Applications, architecture, protocols, etc.</li> <li>• Understand the characteristics of IoT devices</li> <li>• Know about Physical Design/Logical Design, Functional blocks of IoT and Communication Models.</li> </ul>
2. Things and Connections	4	6	After completing this unit, learner will be able to understand <ul style="list-style-type: none"> <li>• Closed loop/ feedback loop system.</li> <li>• The use of sensors, actuators and controllers in the IoT process flow.</li> <li>• TCP/IP Versus OSI models.</li> <li>• Wired and wireless connectivities.</li> </ul>
3. Sensors, Actuators and Microcontrollers	8	12	After completing this unit, learner will be able to understand <ul style="list-style-type: none"> <li>• The role of Sensors, transducers in measuring physical quantities</li> <li>• Working and characteristics of actuators</li> <li>• Role and use of microcontroller in building various electronic devices</li> </ul>
4. Building IoT Applications	20	30	After completing this unit, learner will be able to

			<p>understand</p> <ul style="list-style-type: none"> <li>• Working of microcontroller and hardware prototyping Arduino platform</li> <li>• The role of 'C' language in building IoT applications</li> <li>• Built-in Data-type, operators-expressions</li> <li>• Conditional statements and loops</li> <li>• Arrays, functions</li> <li>• Digital, analog pins of Arduino</li> <li>• Interfacing sensors, actuator</li> <li>• Using Ardublock GUI tool</li> </ul>
5. Security and Future of IoT Ecosystem	4	6	<p>After completing this unit, learner will be able to understand</p> <ul style="list-style-type: none"> <li>• Need of security in IoT</li> <li>• Various basic concept of security</li> <li>• Security levels</li> <li>• Need of powerful CPU for Future IoT eco system</li> </ul>
6. Soft skills- Personality Development	8	12	<p>After completing this unit, learner will be able to understand</p> <ul style="list-style-type: none"> <li>• Role of positive personality and determinants of personality</li> <li>• Self-esteem</li> <li>• Communication and writing skills</li> </ul>

#### 4.5. Marks Distribution

Module Unit	Written Marks (Max.)
1. Introduction to IoT – applications/devices, protocols, communication model	10
2. Things and Connections	10
3. Sensors, Actuators and Microcontrollers	15
4. Building IoT applications	40
5. Security and Future of IoT Ecosystem	5
6. Soft skills-Personality Development	20
Total	100

#### 4.6. Detailed Syllabus

##### (i) Introduction to Internet of Things – applications/devices, protocols, 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.

##### (ii) Things and Connections

Working of Controlled Systems, Real-time systems with feedback loop e.g. thermostat in refrigerator, 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.

##### (iii) 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.

##### (iv) 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. 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.

#### (v) 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

#### (vi) Soft skills-Personality Development

Personality Development - Determinants of Personality- self-awareness, motivation, self-discipline, etc., building a positive personality, gestures.

Self-esteem - self-efficacy, self-motivation, time management, stress management, Etiquettes & manners.

Communication and writing skills- objective, attributes and categories of communication, Writing Skills – Resume, Letters, Report, Presentation, etc. Interview skills and body language.

### 4.7. Use-case for building IoT based application

#### A. Using Arduino and sensors/actuators

- i. Interfacing Light Emitting Diode(LED)- Blinking LED :  
This use case will be used for familiarizing the GPIO peripheral of at mega micro controller. The LED will be used as a device and GPIO will work as output mode.
- ii. Interfacing Button and LED – LED blinking/glow when button is pressed  
This use case will help to understand the GPIO in two different modes, Input - Button and LED - output mode.

- iii. Interfacing Light Dependent Resistor (LDR) and LED, displaying automatic night lamp  
This use case will help to understand ADC peripheral and how to read analog data from sensors.
- iv. Interfacing Temperature Sensor(LM35) and/or humidity sensor (e.g. DHT11)  
This use case will help to connect traditional environmental monitoring sensors (Temperature and humidity) to the Arduino development board. Also use the suitable libraries for implementing these case studies.
- v. Interfacing Liquid Crystal Display(LCD) – display data generated by sensor on LCD  
This case study will demonstrate how to provide local display unit with Arduino micro controller. Use suitable libraries for implementing these case studies.
- vi. Interfacing Air Quality Sensor-pollution (e.g. MQ135) - display data on LCD, switch on LED when data sensed is higher than specified value.  
This use case will help to understand how to use traditional smart pollution management sensors with Arduino platform for developing applications as a part of smart city projects.
- vii. Interfacing Bluetooth module (e.g. HC05)- receiving data from mobile phone on Arduino and display on LCD  
This use case will help to understand the connectivity solution to Arduino to a gadget like mobile phone. Bluetooth is used as connectivity solution in this application.
- viii. Interfacing Relay module to demonstrate Bluetooth based home automation application. (using Bluetooth and relay).  
This use case will enable the IoT node capability of Arduino development boards by integrating actuator (relay connected to GPIO) to Arduino board and remote connectivity (Using Bluetooth) using a mobile phone with the help of a readily available Bluetooth serial application.

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