



HSNC UNIVERSITY, MUMBAI

Board of Faculty of Science & Technology

Board of Studies in the Subject of Information Technology

- 1.) Name of Chairperson/Co-Chairperson/Coordinator: -
 - a) **Dr. Rakhi O. Gupta : Chairperson** Assistant Professor and Head, Department of IT, K.C College, Churchgate; rakhi.gupta@kccollege.edu.in 9619914191.

- 2.) Two to five teachers each having minimum five years teaching experience amongst the full-time teachers of the Departments, in the relevant subject.
 - a) **Ms. Pragati V Thawani : Co- Chairperson** (Assistant Professor, Department of IT, K. C College, Churchgate) pragati.thawani@kccollege.edu.in, **9960782000**
 - b) **Ms. Sandhya S Bhavsar:** (Assistant Professor, Department of IT, K. C. College, Churchgate) sandhya.bhasvar@kccollege.edu.in **8446677483**

- 3.) One Professor / Associate Professor from other Universities or professor / Associate Professor from colleges managed by Parent Body; nominated by Parent Body; -
 - a) **Dr. Rasika S. Mallya** (Associate Professor, Navinchandra Mehta Institute of Technology & Development, Mumbai.) rasikamallya@gmail.com **9819682436**.

- 4.) Four external experts from Industry / Research / eminent scholar in the field relevant to the subject nominated by the Parent Body;
 - a) **Dr. Hiren Dand** (Head of Department (IT), Mulund College of Commerce) Hiren.dand@mccmulund.ac.in **9821140717**.
 - b) **Mr. Asif K. Rampurawala**(Vice Principal, Vidyalankar School of Information Technology); asif.rampurawala@vsit.edu.in **9820765273**.
 - c) **Mr. Kaushal Shah** (Senior Manager Reliance Power Ltd.) Kaushalshah78@gmail.com 9869069203.
 - d) **Mr. Prabhav Daga**(Proprietor & Partner Curaksha, Gianda Trading Solutions, LLP.) prabhav@curaksha.com **9820809884**.

- 5.) Top rankers of the Final Year Graduate and Final Year Post Graduate examination of previous year of the concerned subject as invitee members for discussions on framing or revision of syllabus of that subject or group of subjects for one year
 - a) **Ms. Suwati Singh** (UG student-18-19) Suwatisingh10@gmail.com **8451926698**
 - b) **Ms. Sonali Tiwari** (PG student18-19) Sonali.tiwari0845@gmail.com **8080452813**

Part –I

Outline of Choice Based Credit System as outlined by University Grants Commission:

R. ****: The Definitions of The Key Terms Used in The Choice Based Credit System And Grading System Introduced From The Academic Year 2020-2021 Are As Under:

1. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
2. **Elective Course:** Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
 - 2.1 **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).
 - 2.2 **Dissertation/Project:** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.
 - 2.3 **Generic Elective (GE) Course:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.
3. **Choice Base Credit System:** CBCS allows students to choose inter- disciplinary, intra-disciplinary courses, skill-oriented papers (even from other disciplines according to their learning needs, interests and aptitude) and more flexibility for students.
4. **Honors Program:** To enhance employability and entrepreneurship abilities among the learners, through aligning Inter Disciplinary / Intra Disciplinary courses with Degree Program. Honours Program will have 40 additional credits to be undertaken by the learner across three years essentially in Inter / Intra Disciplinary course.

A learner who joins Regular Undergraduate Program will have to opt for Honours Program in the first year of the Program. However, the credits for honours, though divided across three years can be completed within three years to become eligible for award of honours Degree.

5. **Program:** A Program is a set of course that are linked together in an academically meaningful way and generally ends with the award of a Degree Certificate depending on the level of knowledge attained and the total duration of study, B.Sc. Programs.

6. **Course:** A 'course' is essentially a constituent of a 'program' and may be conceived of as a composite of several learning topics taken from a certain knowledge domain, at a certain level. All the learning topics included in a course must necessarily have academic coherence, i.e. there must be a common thread linking the various components of a course. A number of linked courses considered together are in practice, a 'program'.
7. **Bridge Course:** Bridge course is visualized as Pre semester preparation by the learner before commencement of regular lectures. For each semester the topics, whose knowledge is considered as essential for effective and seamless learning of topics of the Semester, will be specified. The Bridge Course can be conducted in online mode. The Online content can be created for the Bridge Course Topics.
8. **Module and Unit:** A course which is generally an independent entity having its own separate identity, is also often referred to as a 'Module' in today's parlance, especially when we refer to a 'modular curricular structure'. A module may be studied in conjunction with other learning modules or studied independently. A topic within a course is treated as a Unit. Each course should have exactly 3 Units.
9. **Self-Learning: 20% of the topics will be marked for Self-Learning.** Topics for Self-Learning are to be learned independently by the student, in a time- bound manner, using online and offline resources including online lectures, videos, library, discussion forums, fieldwork, internships etc.

Evaluative sessions (physical/online), equivalent to the credit allocation of the Self Learning topics, shall be conducted, preferably, every week for each course. Learners are to be evaluated real time during evaluative sessions. The purpose of evaluative sessions is to assess the level of the students' learning achieved in the topics are marked for Self-Learning.

The teacher's role in these evaluative sessions will be that of a Moderator and Mentor, who will guide and navigate the discussions in the sessions, and offer concluding remarks, with proper reasoning on the aspects which may have been missed by the students, in the course of the Self-Learning process.

The modes to evaluate self-learning can be a combination of the various methods such as written reports, handouts with gaps and MCQs, objective tests, case studies and Peer learning. Groups can be formed to present self- learning topics to peer groups, followed by Question-and-Answer sessions and open discussion. The marking scheme for Self-Learning will be defined under Examination and Teaching.

The topics stipulated for self-learning can be increased or reduced as per the recommendations of the Board of Studies and Academic Council from time to time. All decisions regarding evaluation need to be taken and communicated to the stakeholders preferably before the commencement of a semester. Some exceptions may be made in exigencies, like the current situation arising from the lockdown, but such adhoc decisions are to be kept to the minimum possible.

10. **Credit Point:** Credit Point refers to the 'Workload' of a learner and is an index of the number of learning hours deemed for a certain segment of learning. These learning hours may include a variety of learning activities like reading, reflecting, discussing, attending lectures / counseling

sessions, watching especially prepared videos, writing assignments, preparing for examinations, etc. Credits assigned for a single course always pay attention to how many hours it would take for a learner to complete a single course successfully. A single course should have, by and large a course may be assigned anywhere between 2 to 8 credit points wherein 1 credit is construed as corresponding to approximately 30 to 40 learning hours.

11. **Credit Completion and Credit Accumulation:** Credit completion or Credit acquisition shall be considered to take place after the learner has successfully cleared all the evaluation criteria with respect to a single course. Thus, a learner who successfully completes a 4 CP (Credit Point) course may be considered to have collected or acquired 4 credits. learner level of performance above the minimum prescribed level (viz. grades / marks obtained) has no bearing on the number of credits collected or acquired. A learner keeps on adding more and more credits as he completes successfully more and more courses. Thus, the learner 'accumulates' course wise credits.
12. **Credit Bank:** A Credit Bank in simple terms refers to stored and dynamically updated information regarding the number of Credits obtained by any given learner along with details regarding the course/s for which Credit has been given, the course-level, nature, etc. In addition, all the information regarding the number of Credits transferred to different programs or credit exemptions given may also be stored with the individual's history.
13. **Credit Transfer:** (performance transfer) When a learner successfully completes a program, he/she is allowed to transfer his/her past performance to another academic program having some common courses and Performance transfer is said to have taken place.
14. **Course Exemption:** Occasionally, when two academic programs offered by a single university or by more than one university, may have some common or equivalent course-content, the learner who has already completed one of these academic programs is allowed to skip these 'equivalent' courses while registering for the new program. The Learner is 'exempted' from 'relearning' the common or equivalent content area and from re-appearing for the concerned examinations. It is thus taken for granted that the learner has already collected in the past the credits corresponding to the exempted courses.

Part-II

O*** The fees for transfer of credits or performance will be based on number of credits that a learner has to complete for award of the degree.**

The Scheme of Teaching and Examination:

The performance of the learners shall be evaluated in two components: Internal Assessment with 40% marks by way of continuous evaluation and by Semester End Examination with 60% marks by conducting the theory examination.

INTERNAL ASSESSMENT: - It is defined as the assessment of the learners on the basis of continuous evaluation as envisaged in the credit-based system by way of participation of learners in various academic and correlated activities in the given semester of the programme.

A). Internal Assessment – 40% 40 marks

Practical's (internal Components of the Practical Course

1. For Theory Courses

Sr. No.	Particulars	Marks
1	ONE classtest/online examination to be conducted in the given semester	15 Marks
2	One assignment based on curriculum (to be assessed by the teacher Concerned	10 Marks
3	Self-Learning Evaluation	10 Marks
4	Active participation in routine class instructional deliveries	05 Marks

2. For Courses with Practicals

Each practical course can be conducted out of 50 marks with 20 marks for internal and 30 marks for external

Practical's (Internal component of the Practical Course)

Sr. No	Evaluation type	Marks
1	Two Best Practicals /Assignments/Presentation /Preparation of models/ Exhibits Or One Assignment/ project with class presentation to be assessed by teacher concerned	10
2	Journal	05
3	Viva	05

The semester end examination (external component) of 60 % for each course will be as follows:

i) **Duration – 2 Hours** ii) **Theory Question Paper**

Pattern: -

1. There shall be four questions each of 15 marks. On each unit there will be one question and the fourth one will be based on entire syllabus.
2. All questions shall be compulsory with internal choice within the questions. (Each question will be of 20 to 23 marks with options.)

3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depend on the weightage of the topic.

The marks will be given for all examinations and they will be converted into grade (quality) points. The semester-end, final grade sheets and transcripts will have only credits, grades, grade points, SGPA and CGPA.

3. Project and Assignment:

Project or Assignment, which can in the following forms

- Case Studies
- Videos
- Blogs
- Research paper (Presented in Seminar/Conference)
- Field Visit Report
- Presentations related to the subject (Moot Court, Youth Parliament, etc.)
- Internships (Exposition of theory into practice)
- Open Book Test
- any other innovative methods adopted with the prior approval of Director Board of Examination and Evaluation.

4. Self-Learning Evaluation

- **20% OF THE TOPICS OF CURRICULUM ARE LEARNED BY THE STUDENT THROUGH SELF LEARNING USING ONLINE / OFFLINE ACADEMIC RESOURCE SPECIFIED IN THE CURRICULUM.**
- **HENCE 20% OF THE LECTURES SHALL BE ALLOCATED FOR EVALUATION OF STUDENTS ON SELF LEARNING TOPICS**
- The identified topics in the syllabus shall be learnt independently by the students in a time bound manner preferably from online resources. Evaluative sessions shall be conducted by the teachers and will carry 10 Marks.
- **CLUB The self-learning topics into 3-4 GROUPS OF TOPICS ONLY FOR EVALUATION.**
- **PRESCRIBE TIME DURATION (IN DAYS) FOR COMPLETION OF EACH GROUP OF TOPIC AND EARMARK SELF LEARNING EVALUATION LECTURES IN THE TIMETABLE. HENCE EACH GROUP OF TOPIC CAN BE ASSIGNED 3 REGULAR LECTURES FOR THIS EVALUATION FOR ENTIRE CLASS**

3 Sub Topics

Each evaluative session shall carry 3 Marks (3 x 3 Units = 9 Marks). Students who participate in all evaluative sessions shall be awarded 1 additional Mark.

4 Sub Topics

Each evaluative session shall carry 2.5 Marks (2.5 x 4 Units = 10 Marks)

- **EVALUATION OF SELF LEARNING TOPICS CAN COMMENCE IN REGULAR LECTURES ASSIGNED FOR SELF LEARNING EVALUATION IN THE TIMETABLE**

3 Evaluative sessions

Each evaluative session shall carry 3 Marks (3 x 3 = 9 Marks). Students who participate in all evaluative sessions shall be awarded 1 additional Mark

4 Evaluative sessions

Each evaluative session shall carry 2.5 Marks (2.5 x 4 = 10 Marks).

Methods for Evaluation of Self-learning topics:

- Seminars/presentation (PPT or ppt), followed by Q&A – Objective questions / Quiz / Framing of MCQ questions.
- Debates
- Group discussion
- You-Tube videos (Marks shall be based on the quality and viewership)
- Improvisation of videos
- Role Play followed by question-answers

TEACHERS CAN FRAME OTHER METHODS OF EVALUATION ALSO PROVIDED THAT THE METHOD, DULY APPROVED BY THE COLLEGE EXAMINATION COMMITTEE, IS NOTIFIED TO THE STUDENTS AT LEAST 7 DAYS BEFORE THE COMMENCEMENT OF THE EVALUATION SESSION AND IS FORWARDED FOR INFORMATION AND NECESSARY ACTION AT LEAST 3 DAYS BEFORE THE COMMENCEMENT OF THE EVALUATION SESSION

- Viva Voce
- Any other innovative method

SEMESTER END EXAMINATION: - It is defined as the examination of the learners on the basis of performance in the semester end theory / written examinations.

B. Semester End Examination-60%

60 Marks

- 1) Duration – These examinations shall be of 2 Hours duration.
- 2) Question Paper Pattern: -
 - i. There shall be four questions each of 15 marks.
 - ii. All questions shall be compulsory with internal choice within the questions.
 - iii. Question may be sub-divided into sub-questions a, b, c, d & e only and the allocation of marks depends on the weightage of the topic.

THE MARKS OF THE INTERNAL ASSESSMENT SHOULD NOT BE DISCLOSED TO THE STUDENTS TILL THE RESULTS OF THE CORRESPONDING SEMESTER IS DECLARED.



HSNC University Mumbai
(2020-2021)

Ordinances and Regulations

With Respect to

Choice Based Credit System (CBCS)
For the Program Under

The Faculty of Science and Technology

For the Course

Information Technology

Curriculum – Second Year Undergraduate Program
Semester-III and Semester -IV

2021-2022

Part 1

Preamble

The B.Sc. Information Technology program is started with an aim to make the students employable and impart industry-oriented training.

- **Course Objective:** The main objectives of the course are:
 - To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems related to human, technology and environmental factors.
 - To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programs.
 - To be capable of managing complex IT projects with consideration of various factors.
 - To work effectively as a part of a team to achieve a common stated goal.
 - To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
 - To communicate effectively with a range of audiences both technical and non-technical.
 - To develop an aptitude to engage in continuing educational and professional development.
- The syllabus is aimed to achieve the following objectives. The syllabus spanning three years covers the industry endorsed relevant courses. The students will be ready for the jobs available in different fields like:
 - Software Development
 - Website Development
 - Mobile app development
 - Embedded Systems Programming
 - Embedded Systems Development
 - Software Testing
 - Networking
 - Database Administration
 - System Administration
 - Cyber Law Consultant
 - GIS (Geographic Information Systems)
 - Introduction to Unity and C# in Unity
 - IT Service Desk
 - Security
 - Digital Marketing
 - Machine Learning
 - Artificial Intelligence
 - Graphics and Animation
 - And many others
- Students will also be trained in communication skills, green computing and will be sent to work in industry as interns.

1. Process adopted for curriculum designing:

The Department conducted multiple meetings with academic partners, industry partners and BOS Members. After discussion with them personally, via mail, via messages, the changes in the syllabus were introduced. The course design focusses on immediate employability of the student after graduation.

2. Salient features, how it has been made more relevant:

After discussion and interaction with industry and academic experts, many innovative changes are introduced in the syllabus. New elective subjects like Digital Marketing, Android Programming, Data Analytics using R Programming are introduced. Certain portion of all subjects is modified, and new subtopics are introduced. Some subjects from third year are shifted to semester-III and semester-IV to introduce new subjects in final year.

3. Learning Outcomes:

The revised syllabus is expected to provide students with a strong foundation in Technology, Mathematical and Scientific fundamentals required to develop problem solving ability. It is expected to train students in comprehending, analyzing, designing, and creating novel products that provide solution frameworks to the real-world problems. It will inculcate in students, the ability to gain multidisciplinary knowledge, modern tools usage and skills necessary for designing, developing and deploying software and hardware based applications. Our graduates should be able to set up various entrepreneurship ventures which in turn will facilitate employability.

4. Input from stakeholders:

There are modifications suggested in syllabus by industry personnel, alumni, and students. Subjects which have greater market applicability like Core Java, Database Management System, Web Programming and Applied Mathematics have been upgraded with latest technologies. New subjects like Android Programming, Data Analytics using R programming and Digital Marketing are incorporated. Students are introduced to Statistics and Marketing concepts for technical analysis with the help of upgraded programming skills.

**Part 2 - The Scheme of Teaching and Examination is asunder:
Semester – III
Summary**

Sr. No.	Choice Based Credit System		Subject Code	Remarks
1	Core Course (Information Technology)		US-SIT-301, US-SIT-302, US-SIT-303, US-SIT-304. US-SIT-3P1, US-SIT-3P2, US-SIT-3P3, US-SIT-3P4.	
2	Elective Course	Discipline Specific Elective (DSE) Course		
		2.1	Interdisciplinary Specific Elective (IDSE) Course	
		2.2	Dissertation/Project	
		2.3	Generic Elective (GE) Course	
3	Ability Enhancement Compulsory Courses (AECC)			
	Skill Enhancement Courses (SEC)		US-SIT-305 US-SIT-306	
			US-SIT-3P5 US-SIT-3P6	

Second Year Semester -III Internal and External Detailed Evaluation Scheme

Sr. No.	Subject Code	Subject Title	Periods Per Week (Period of 45min)						Credit	Internals				Total Marks
			Units	S. L.	L	T	P	S. L. E		CT+A T=15+5	PA	SEE		
1	US-SIT-301	Web Programming	4	20% *	5	0	0	2	10	20	10	60	100	
2	US-SIT-302	Software Engineering	4	20% *	5	0	0	2	10	20	10	60	100	
3	US-SIT-303	Database Management System	4	20% *	5	0	0	2	10	20	10	60	100	
4	US-SIT-304	Applied Mathematics	4	20% *	5	0	0	2	10	20	10	60	100	
5	US-SIT-305	Android Programming	4	20% *		0	0	2	10	20	10	60	00	
6.	US-SIT-306	Digital Marketing	4	20% *		0	0	2	10	20	10	60	100	

7	US-SIT-3P1	Practical Based US-SIT- 301	-	-	0	-	3	2				50 (40+10)	50	
7	US-SIT-3P2	Practical Based US-SIT- 302	-	-	0	-		2				50 (40+10)	50	
8	US-SIT-3P3	Practical Based US-SIT- 303	-	-	0		3	2				50 (40+10)	50	
9	US-SIT-3P4	Practical Based US-SIT- 304	-		0	-	3	2				50 (40+10)	50	
10	US-SIT-3P5	Practical Based US-SIT-305	-	-		-	3	2				50 (40+10)	50	
11	US-SIT-3P6	Practical Based US-SIT-306	-			-	3	2				50 (40+10)	50	
Total Periods/ Credit									20					750
			305											

***One to two lectures to be taken for CONTINUOUS self -learning evaluation**

Second Year Semester III – Units – Topics- Teaching Hours

S. N	Subject Code & Title	Subject Unit Title	Lectures (48 min)	Total Lectures	Credit	Total Marks	
1	US-SIT-301	1	Internet and the Word Wide Web	15	60 L	2	100 (60+40)
		2	HTML5 Page layout and navigation	15			
		3	Java Script and CORE Java Script	15			
		4	PHP Advanced PHP and MySQL	15			
2	US-SIT-302	1	Introduction, Software Requirements, Software Processes, Software Development Process Models, Agile software development, Socio-technical system, Critical system	15	60 L	2	100 (60+40)
		2	System Models, Requirements Engineering Processes, Architectural Design, User Interface Design, Project Management, Quality Management	15			
		3	Verification and Validation, Software Measurement, Software Cost Estimation, Fundamentals & Principles of testing, Testing Strategy, Software Maintenance	15			
		4	Process Improvement, Service Oriented Software Engineering, Software reuse, Distributed software engineering	15			
3	US-SIT-303	1	Introductory concepts of DBMS	15	60 L	2	100 (60+40)
		2	Relational database model	15			
		3	Constraints, Views and SQL	15			
		4	Transaction management and Concurrency	15			
4	US-SIT-304	1	Complex Numbers, Laplace Transform, Inverse Laplace Transform, Transfer functions, impulse response function of linear systems	15	60 L	2	100 (60+40)
		2	Equation of the first order and of the first degree, Differential equation of the first order of a degree higher than the first, Linear Differential Equations with Constant Coefficients, Higher Order Differential Equations with Constant Coefficients	15			
		3	Z Transform, Properties of Z Transform, Inverse Z Transform, Analysis of system using Z Transform	15			
		4	Fourier Transform, Properties of Fourier Transform, Inverse Fourier Transform, Applications of Fourier Transform	15			
		1	Introduction to Android	15	60 L	2	100 (60+40)
		2	Material Design UI & Layouts	15			

5	US-SIT-305	3	Introduction to Cordova	15			
		4	Multi-Platform Deployment	15			
6	US-SIT-306	1	Introduction of digital marketing, Web Analytics, Search Engine Optimization				
		2	Search Engine Marketing, Ecommerce Marketing				
		3	Social Media Marketing & Content, Video Marketing, Influencer Marketing, Paid/Performance Marketing, E-mail Marketing				
		4	Digital Media Planning & Buying, Digital Marketing Strategy				
7	US-SIT-3P1	1	Practical based on US-SIT-301 Web Programmin		36 L x3 batches= 108 lectures	2	50
8	S-SIT-3P2	2	Practical based on US-SIT-302 Software Engineering		36 L x3 batches= 108 lectures	2	50
9	US-SIT-3P3	3	Practical based on US-SIT-303 Database Management System		36 L x3 batches= 108lectures	2	50
10	US-SIT-3P4	4	Practical based on US-SIT-304 Applied Mathematics		36 L x3 batches= 108lectures	2	50
11	US-SIT-3P5	5	Practical based on US-SIT-305 Android Programming		36 L x3 batches= 108 lectures	2	50
12	US-SIT-3P6	6	Practical based on US-SIT-306 Digital Marketing		36L X3 batches=108 Lectures	2	50
			+TOTAL			20	750

Lecture Duration – 48 Minutes

One Credit =15 Hours

L: Lecture: Tutorials P: Practical Ct-Core Theory, Cp-Core Practical, SLE-Self learning evaluation CT-Commutative Test, SEE- Semester End Examination, PA-Project Assessment, AT- Attendance

**Part 3: Detailed Scheme
Theory**

Curriculum Topics along with Self-Learning topics -To be covered, through self-learning mode along with the respective Unit. Evaluation of self-learning topics to be undertaken before the concluding lecture instructions of the respective unit

Course Code: US-SIT-301 Web Programming

Unit	Content	No. of Lectures
1	<p>1.1 Internet and the Word Wide Web: Introduction to Web: What is Internet? Introduction to internet and its applications, E-mail, Telnet, FTP, e-commerce, video conferencing, e-business, Internet service providers, , Introduction to Word Wide Web(WWW) and its evolution, domain name server, internet address, uniform resource locator (URL), browsers-Introduction to Chromium Search engine, web server-Apache, Internet Information Services(IIS), proxy servers, Comparative study of browsers(internet explorer, Mozilla Firefox, chrome, Netscape navigator etc.) HTTP protocol: Request and Response, Bandwidth and Cache, display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation. Basic Structure of HTML. Introduction to various web technologies.</p> <p>1.2 HTML5: Introduction, Why HTML5? Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. Introduction XHTML, comparison between HTML and XHTML.</p>	15
2	<p>2.1 HTML5 Page layout and navigation: Creating navigational aids: planning site organization, creating text-based navigation bar, creating graphics based navigation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts: HTML5 semantic tags, creating divisions, creating HTML5 semantic layout, positioning and formatting divisions. Style sheets, CSS formatting text using style sheets, formatting paragraphs using stylesheet Introduction to CSS3 : Power of CSS, Anatomy of CSS Rule, Element Class and ID Selector, Style Placement, Box model, Background Property, Responsive Design, Media Queries, Relative and Absolute Element Positioning.</p> <p>2.2 HTML5 Tables, Forms and Media: Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment</p>	15

	<p>2.3 Creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page</p> <p>2.4 XML: Introduction to XML, uses of XML, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT.</p>	
3	<p>3.1 Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), -- (Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), (Comma operator), delete, new, this, void</p> <p>Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while</p> <p>3.2 Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, regExp</p> <p>3.3 Events and Event Handlers : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDbClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload The DOM and web browser environments, Manipulation using DOM, forms and validations.</p> <p>3.4 DHTML: Combining HTML, CSS and JavaScript, Events and buttons, Introduction to Ajax.</p>	15
4	<p>4.1 PHP: Why PHP and MySQL? Server-side scripting, PHP syntax and variables, comments, types, control structures, branching, looping, termination, functions, passing information with PHP, GET, POST, formatting form variables, superglobal arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems</p> <p>4.2 Advanced PHP and MySQL: PHP/MySQL Functions, Integrating web forms and databases, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies. Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myAdmin</p>	15

Self-Learning topics (Unit wise):

Sub- unit	Topic
1.1	<p>What is Internet? Introduction to internet and its applications, E-mail, Telnet, FTP, e-commerce, video conferencing, e-business, Internet service providers</p> <p>Comparative study of browsers (Internet explorer, Mozilla Firefox, chrome, Netscape navigator etc.)</p>

2.2	Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment
3.1	Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while

Online Resources

1. https://nptel.ac.in/courses/106/106/106106156/
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Reference Books:

US-SIT-301 Paper I

1. Web Design The Complete Reference., Thomas Powell.
2. HTML5 Step by Step, Faithe Wempen, Microsoft Press,2011
3. PHP 5.1 for Beginners, Ivan Bayross, Sharanam Shah, SPD,2013.
4. PHP 6 and MySQL Bible, Steve Suehring, Wiley, 2009
5. JavaScript 2.0: The Complete Reference, Thomas Powell and Fritz Schneider, Tata McGraw Hill,2nd edition

Course Code: US-SIT-302 Software Engineering

Unit	Content	No. of Lectures
1	<p>1.1 Introduction: What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.</p> <p>1.2 Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements.</p> <p>1.3 Software Processes: Process and Project</p> <p>1.4 Software Development Process Models.</p> <ul style="list-style-type: none"> • Waterfall Model. • Prototyping. • Iterative Development /Spiral Model • Rational Unified Process. • The RAD Model • Time boxing Model. <p>1.5 Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management.</p> <p>1.6 Socio-technical system: Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as</p>	15

	<p>organization, people and computer, Legacy Systems.</p> <p>1.7 Critical system: Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems.</p>	
2	<p>2.1 System Models: Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.</p> <p>2.2 Requirements Engineering Processes: Feasibility study, Requirements elicitation and analysis, Requirements Validations, Requirements Management..</p> <p>2.3 Architectural Design: Architectural Design Decisions, System Organization, Modular Decomposition Styles, Control Styles, Reference Architectures.</p> <p>2.4 User Interface Design: Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.</p> <p>2.5 Project Management: Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management</p> <p>2.6. Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics.</p>	15
3	<p>3.1 Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. V-model for software, Testing during stages of V-model, VV Model, Critical Roles and Responsibilities. Acceptance Testing.</p> <p>3.2 Software Measurement: Size-Oriented Metrics, Function-Oriented Metrics, Extended Function Point Metrics</p> <p>3.3 Software Cost Estimation: Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing</p> <p>3.4 Fundamentals & Principles of testing: Introduction, Necessity of testing, what is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Important Features of Testing Process, Misconceptions About Testing, Unit Testing , Component Testing System Testing, Test Case Design, Test Automation.</p> <p>3.5 Testing Strategy: Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan)/ Approaches , Testing Process, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing. Software testing techniques – White box and black box testing – Testing for specialized environment, architectures, and applications Use of software testing in web application, e-commerce, security and GUI.</p> <p>3.6 Software Maintenance: Management of maintenance, Maintenance process, Maintenance models, Regression testing, Reverse engineering, Software reengineering, Configuration management, documentation.</p>	15
4	<p>4.1 Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, Process Change, The CMMI</p>	15

<p>Process Improvement Framework.</p> <p>4.2 Service Oriented Software Engineering: Services as reusable components, Service Engineering, Software Development with Services.</p> <p>4.3 Software reuse: The reuse landscape, Application frameworks, Software product lines, COTS product reuse.</p> <p>4.4 Distributed software engineering: Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service</p> <p>Case Study: Project tracking (including defect tracking, status reports, milestone analysis)</p>	
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Self-Learning topics (Unit wise)

Sub Unit	Topics
1.6	Socio-technical system: Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computer, Legacy Systems.
2.3	System Organization, Reference Architectures.
2.4	Need of UI design, Design issues, The UI design Process,
2.6.	Quality Planning
3.1	Planning Verification and Validation,
3.3	Software Productivity, Project Duration and Staffing
3.4	Introduction, Necessity of testing, What is testing? The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Important Features of Testing Process, Misconceptions About Testing,
3.5	Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing. Use of software testing in web application, e-commerce, security and GUI.
4.4	Case Study: Project tracking (including defect tracking, status reports, milestone analysis)

Online Resources

<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/106/105/106105182/ 2. https://nptel.ac.in/courses/106/105/106105150/ 3. https://nptel.ac.in/courses/106/101/106101061/
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Reference Books:

US-SIT-403 Paper III

1. Software Engineering by Ian Somerville, Pearson Education. Ninth Edition.
2. Software Engineering by Pankaj Jalote, Narosa Publication
3. Software engineering, a practitioner’s Approach by Roger Pressman, Tata Mcgraw-Hill, Seventh Edition.
4. Software Engineering principles and practice by WS Jawadekar, Tata Mcgraw-hill
5. Software Testing and Continuous Quality Improvement by William E. Lewis, CRC Press, Third

Edition, 2016

6. Software Testing: Principles, Techniques and Tools by M. G. Limaye, TMH, 2017.
7. Foundations of Software Testing by Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black, Cengage Learning, Third Edition.
9. Software Testing Technique by Boris Beizer, Dreamtech Press, Premier press 2014
10. Software Testing: A Craftsman’s Approach by Paul C. Jorgenson, CRC Press, Fourth Edition 2017
11. Software Testing A Craftsman’s approach by Paul C. Jorgensen, CRC Press, Second Edition 1997

Course Code: US-SIT-303 Database Management Systems

Unit	Content	No. of Lectures
1	<p>1.1 Introductory concepts of DBMS: What is database system, purpose of database system, Data Abstraction, View of data- The Three Levels of Architecture-The External Level- the Conceptual Level- the Internal Level-Mapping , Instances and Schemas, Data Independence - Relation Systems and Others, Database Languages- DDL ,DML. Database System architecture- levels, Database Users and DBA, Database Management Systems- Client/Server Architecture.3-tier Architecture,</p> <p>1.2 Data Models: The importance of data models, Basic building blocks, Business rules, The evolution of data models.</p> <p>1.3 Database Design, ER Diagram: Database design and ER Model: Entity and Entity Set, Attribute and Domain, Symbols in ER-Diagram, ER-Diagram with Role-Indicators, ER-Diagram with Ternary Relationship Keys -Super, Candidate Keys, Primary Key, Foreign, Key Unique, Surrogate, Composite, Mapping Cardinalities, Relationship and Relationship Sets, Weak Entity Set with Total Participation. Entity Relationship Diagram.</p> <p>1.4 Extended ER: Specialization and Generalization. ER-Diagram with Aggregation, ER-Diagram with Existence Dependency. Forming Schemas From ER-Diagram, Database System Applications.</p>	15
2	<p>2.1 Relational database model: Relational Model and Codd rules, Logical view of data, keys, integrity rules, Relational Database design: features of good relational database design, Mapping from ER model to Relational Model, Anomalies in Relational Model.</p> <p>Relational Database design.</p> <p>Functional Dependency and Normalization: Definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FDs, Rules of Functional Dependency.</p> <p>Normalization: Problem of Redundancy in database system, Normal Forms-1Nf, 2NF, 3NF, Decomposition using FD- dependency preservation, BCNF, Multi-valued dependency, 4NF, Join dependency and 5NF, Canonical Cover Of FDs, 3 NF Algorithm.</p>	15

	2.2 Relational Algebra: Introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison.	
3	<p>3.1 Constraints, Views and SQL: Constraints, types of constraints, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views. SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers.</p> <p>3.2 Data Storage and Querying: Storage and File Structure-Overview, File Organization, Organization of Records in Files, Data-Dictionary Storage. Indexing and Hashing: Indexing and its types, Sorted Files, Ordered Indices, B⁺-Tree Index Files, B-Tree Index Files.</p> <p>3.3 Query Processing & Query Optimization: Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans, materialized views. Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Index Definition in SQL, Multiple-Key Access</p>	15
4	<p>4.1 Transaction management and Concurrency: Testing of Serializability, Multiple Granularity, Definition of Transaction, State Transition of a Transaction, Architecture of a Database Transaction, ACID properties, serializability and Recoverability, concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management. Security: Introduction, Discretionary access control, Mandatory Access Control, Data Encryption.</p> <p>4.2 PL-SQL: Beginning with PL / SQL, Identifiers and Keywords, Operators, Expressions, Sequences, Control Structures, Cursors and Transaction, Collections and composite data types, Procedures and Functions, Exceptions Handling, Packages, With Clause and Hierarchical Retrieval, Triggers.</p>	15

Self-Learning topics (Unit wise):

	Topic
1.3	Database System Applications
2.2	Canonical Cover Of FDs, 3 NF Algorithm
3.3	Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Index Definition in SQL, Multiple-Key Access
4.2	Identifiers and Keywords, Operators, Expressions, Sequences Control Structures.

Online Resources

<https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-cs04/>

Reference Books

US-SIT-303 Paper III

1. Database System and Concepts, A Silberschatz, H Korth, S Sudarshan, McGraw- Hill 6th Edition.
2. Introduction to Database System, C.J.Date, Pearson, First,2003.
3. Database Systems, RobCoronel, Cengage Learning, Twelfth Edition.
4. SQL – A Complete Reference, Alexis Leon Mathew Leon, McGraw Hill Education First 2002.
5. Oracle PL/SQL Programming, Steven Feuerstein, Orielly 6th edition.
6. SQL- PL/SQL, Ivan bayross.
7. Programming with PL/SQL for Beginners, H.Dand, R.Patil and T. Sambare, X –Team, First,2011.

Course Code: US-SIT-304 Applied Mathematics

Unit	Content	No. of Lectures
1	<p>1.1 Complex Numbers: Complex number, Equality of complex numbers, Graphical representation of complex number(Argand's Diagram), Polar form of complex numbers, Polar form of $x+iy$ for different signs of x,y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic functions, Differentiation and Integration, Graphs of the hyperbolic functions, Logarithms of complex quality, $j(=i)$ as an operator(Electrical circuits). Algebra and Topology of the complex plane, Geometry of the complex plane</p> <p>1.2 The Laplace Transform: Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives,</p> <p>1.3 Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function (Unit Impulse Function),</p> <p>Application of Laplace Transform to analyze electrical circuits.</p> <p>1.4 Transfer functions, impulse response function of linear systems: Applications of Laplace transform techniques for solving integrals, differential equations, difference equations, integral equations.</p>	15

2	<p>2.1 Equation of the first order and of the first degree: Separation of variables, Equations homogeneous in x and y, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution.</p> <p>2.2 Differential equation of the first order of a degree higher than the first: Introduction, Solvable for p (or the method of factors), Solve for y, Solve for x, Clairaut's form of the equation, Methods of Substitution, Method of Substitution.</p> <p>2.3 Linear Differential Equations with Constant Coefficients: Introduction, The Differential Operator, Linear Differential Equation $f(D) y = 0$, Different cases depending on the nature of the root of the equation $f(D) = 0$, Linear differential equation $f(D) y = X$, The complimentary Function, The inverse operator $1/f(D)$ and the symbolic expiration for the particular integral $1/f(D) X$; the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients.</p> <p>Application of Differential equation</p> <p>2.4 Higher Order Differential Equations with Constant Coefficients: - Solving second order ODE, Existence and uniqueness of solutions of ODE</p>	15
3	<p>3.1 Z Transform: Sequence, Representation of Sequence, Operations on Sequence, Definition of Z transform, Linearity Property (without proof), Z transform of standard sequences- $\sin k$, $\cos k$, $\cosh k$, $\sinh k$</p> <p>3.2 Properties of Z Transform: Change of scale property, Shifting Property, Convolution Theorem</p> <p>3.3 Inverse Z transform: Direct Division. Binomial Expansion, Partial Fraction method, Region Of Convergence of Z Transform,</p> <p>3.4 Analysis of system using Z Transform: Transfer function, Poles and Zeros of transfer function, Stability of system, impulse and step response, relationship between Laplace transform and Z transform. Plotting poles and zeros of transfer function.</p>	15
4	<p>4.1 Fourier Transform: Sub-Topics: Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier Cosine & Sine Transforms of elementary functions.</p> <p>4.2 Properties of Fourier Transform: Linearity, Shifting, Change of scale, Examples. Fourier Transform of Derivatives. Examples. Convolution Theorem (statement only), Relation between discrete time Fourier transform and Z transform, Relation between Fourier Transform and Laplace Transform</p> <p>4.3 Inverse of Fourier Transform: partial fraction method, Examples, Application of Fourier Transform</p>	15

Self-Learning topics (Unit wise):

	Topic
1.1	Algebra and Topology of the complex plane, Geometry of the complex plane
1.2	Laplace Transform of an Integral, Laplace Transform of Derivatives,
1.3	Application of Laplace Transform to analyze electrical circuits. Applications of Laplace transform techniques for solving integrals, differential equations, difference equations, integral equations.
2.2	Solvable for p (or the method of factors), Solve for y, Solve for x
2.3	The complimentary Function, The inverse operator $1/f(D)$ and the symbolic expiration for the particular integral $1/f(D) X$, Application of Differential equation
2.4	Higher Order Differential Equations with Constant Coefficients: Solving second order ODE, Existence and uniqueness of solutions of ODE
3.2	Convolution Theorem
3.3	Partial Fraction method,
3.4	Plotting poles and zeros of transfer function.
4.1	Fourier Cosine & Sine Transforms of elementary functions.
4.2	Shifting, Change of scale, Convolution Theorem
4.3	Partial fraction method, Applications of Fourier Transforms to solutions of ODEs

Online Resources

1. [Integral Transforms and their Applications - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)
2. [Integral Transforms and their Applications - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)
3. [Laplace Transform - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)
4. [Transform Calculus and its applications in Differential Equations - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)
5. [Integral Transforms And Their Applications - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)
6. [Engineering Mathematics - I - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)
7. [Engineering Mathematics - I - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)
8. [Ordinary and Partial Differential Equations and Applications - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)
9. [Complex Analysis - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)
10. [Laplace Transform - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)
11. [Introduction to Methods of Applied Mathematics - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112101001/)

Reference Books

US-SIT-304 Paper IV

1. A text book of Applied Mathematics Vol I, P. N. Wartikar and J. N. Wartikar, Pune Vidyathi Graha, 7th, 1995
2. Applied Mathematics II, , P. N. Wartikar and J. N. Wartikar, Pune Vidyathi Graha, 7th, 1995
3. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publications.

Course code: US-SIT-305 Android Programming

Unit	Content	No. of Lectures
1	<p>1.1 Introduction to Android: Android OS History, Fundamentals of the Android OS, Introduction to ROM, Kernel, Bootloader, AVB, Recovery Mode, Android Root, ADB, Fastboot.</p> <p>1.2 Introduction to Android Platform: Architecture, components, development tools-SDK, ADB, Gradle etc. Installing Android studio.</p> <p>1.3 Kotlin basics: Layouts, navigation, Activity and fragment lifecycles, Architecture components</p>	15
2	<p>2.1 Material Design UI & Layouts: Display Orientation, Views and ViewGroups, Layouts, Action Bars and Navigation Drawers, Android Layout Managers – Linear Layout, Relative Layout, Scroll View, Table Layout, Frame Layout, Action Bar, Working with Views- TextView, EditText View, Button View, RadioButton View, CheckBox View, ImageButton View, ToggleButton View.</p> <p>2.2 Graphics & Animation: Working with Graphics, Using the Drawable Object, Using the ShapeDrawable Object, Concept of Hardware Acceleration, Working with Animations. Geolocation. Database using Firebase.</p> <p>2.3 AndroidX: Extension Support Library.</p>	15
3	<p>3.1 Introduction to Cordova: Cordova CLI, Core Components, Plugins. Advantages, Limitations.</p> <p>3.2 HTML, CSS & JS Basics : Building a Mobile Friendly Layout.</p> <p>3.3 Cordova Environment Setup: Installing Cordova, creating apps, Adding platforms, Buttons, event listeners, functions.</p> <p>3.4 Cordova Plugman: Installing Plugins. Additional commands. Cordova Battery Status, Cordova Camera., Alerts, contacts. Device orientation, confirm function, prompt function.</p> <p>Cordova File System: read, write, create, delete function. File Transfer.</p> <p>3.5 Cordova Globalization: locale function, date function, language function. Media Plugins. Media Capture.</p>	15
4	<p>4.1 Multi-Platform Deployment: Database using MySQL. Basics, Connecting to MySQL, Multi page Applications with AJAX, Single page vs Multipage and their benefits. Managing notifications, phone calls and emails. Publishing Android Application. Basic Security Concepts for Android OS</p> <p>4.2 Ionic: Introduction to Ionic, Environmental Setup, Ionic CSS Components with JavaScript Components.</p>	15

Self-Learning topics (Unit wise):

	Topic
1.2	Installing Android studio.
1.3	Kotlin basics: Layouts, navigation, Activity and fragment lifecycles.
2.1	Working with Graphics, Using the Drawable Object, Using the ShapeDrawable Object
4.1	Basic Security Concepts for Android OS

Online Resources

[Android app using Kotlin - Course \(swayam2.ac.in\)](http://swayam2.ac.in)

Reference Books

US-SIT-305 Paper V

1. Android Cookbook: Problems and Solutions for Android Developers, Ian Darwin, O'Reilly Media, First 2011.
2. Android Application Development for Dummies, Donn Felker John and Wiley Sons, Second 2010
3. Apache Cordova API Cookbook, John M. Wargo, Addison-Wesley, First,2014.
4. Professional Android™ 4 Application Development, RetoMeier, John Wiley & Sons, Third,2012.

Course code: US-SIT-306 Digital Marketing

Unit	Content	No. of Lectures
1	<p>1.1 Introduction to Digital Media Marketing: Terms & Terminologies, Display Advertising, Introduction To Digital Selling, Driving Strategy, WordPress Setup, Understanding WordPress, Working with pages, posts, categories, tags, menus Building Website structure.</p> <p>1.2 Web Analytics: Introduction to Google Analytics, why companies use Analytics, How Analytics works, How to set up Analytics & Define Goals, Filters & Segments. Setting up Search Console, Link website to GA & Search Console, Linking Search Console, Understanding Analytics Reports.</p> <p>1.3 Search Engine Optimization: Understanding Search Landscape, Creating a search visibility plan, How to write content that ranks, Understanding the role of On-page SEO, Understanding the role of Off-page SEO, Article submission to gain links, Research & identify SEO submission sites, Website Audit like a Pro.</p>	15
2	<p>2.1 Search Engine Marketing: Introduction to Google Ads, Why brands use, Google Ads, Landing Pages & Setting up Goal to drive subscribers, Keyword Research Methodology, Extensive Keyword Research Exercise, Campaign mapping, Conversion Tracking & Setup, Hierarchy, Bids & Auctions, Campaign Creation Search, Display and Video</p> <p>2.2 Ecommerce Marketing: Understanding Electronic Commerce & Importance, How to do SEO of E-Commerce Website, Using affiliate Marketing to promote E-Commerce, Technology Infrastructure for E-Commerce, E-commerce Security Issues & Controls, Implementing E-Commerce, E-Commerce Marketing, E-Commerce business models and Strategy.</p>	15
3	<p>3.1 Social Media Marketing & Content: Understanding the various Social Media Platforms, Knowing how to market/communicate through Social Media Platforms Choosing a platform to fit the brand objective, Objectives and Metrics, Research and Mapping Tools, tactics, targets and teams, Developing an effective Social Media Strategy, Content Marketing</p> <p>3.2 Video Marketing: What is Video Marketing, Importance of Video Marketing, 4-step framework to do Video Marketing.</p> <p>3.3 Influencer Marketing: Who is an Influencer? What is Influencer Marketing, Types of Influencers, 5-Step Framework on how to create an Influencer Marketing Plan.</p> <p>3.4 Paid/Performance Marketing: What is Paid & Performance Marketing, Understanding the demographics of the platforms, Understanding the Facebook Business Manager, How do ads on Instagram and Facebook work, A/B testing. Ad copies and Ad creatives.</p> <p>3.5 E-mail Marketing: What is E-mail, Deep Dive into Email Marketing,</p>	15

	Email Authentication & Delivery, What is IP reputation, Email Strategy Content, Design & Optimization, Audience Engagement, Automation & 1:1 Personalization, Email Analytics, Brand Case Studies & Trends in the Industry.	
4	<p>4.1 Digital Media Planning & Buying: Overview- Role of a media planner, Understanding Client Brief: decoding the expectations of the client, Setting Campaign, Objectives, Audience analysis: User behaviour, online opportunities and challenges, Market research, Media formats channels and placement, Media planning tools, software & platform selection, Media research and analysis, Media buying options, art of negotiating rates, Sample media plan, Presentation to the client.</p> <p>4.2 Digital Marketing Strategy: Understand how the elements of a digital marketing strategy can bring customers to the business., Inclusion of the power of search engine optimization, paid search, social media, and online advertising, Reflect on how best to extend brands and cultivate relationships in these channels in a way that supports a holistic digital marketing strategy.</p>	15

Self-Learning topics (Unit wise)

	Topic
1.1	Working with pages, posts, categories, tags, menus Building Website structure.
3.1	Understanding the various Social Media Platforms,
3.5	What is E-mail? Brand Case Studies & Trends in the Industry

Online Resources

[NPTEL : NOC:Marketing Management-II \(Management\) \(digimat.in\)](https://www.nptel.ac.in/courses/106/10001/)

[NPTEL :: Management - NOC:Marketing Management - II](https://www.nptel.ac.in/courses/106/10001/)

Reference Books

US-SIT-306 Paper VI

1. Digital Marketing All-in-One For Dummies, Stephanie Diamond, Wiley and Sons, 1st 2019.
2. Social Media Marketing All-in-one Dummies, Jan Zimmerman, Deborah Ng, 4th Edition; John Wiley & Sons Inc, 2017.
3. Digital Marketing For Dummies, Ryan Deiss and Russ Henneberry. John Wiley & Sons 1st edition 2017.

Links:

<https://neilpatel.com/what-is-digital-marketing/>

<https://www.hubspot.com/resources>

Part - 4 Detailed Scheme Practical
Course Code: US-SIT-3P1

Practical I	Web Programming	Total Credits: 2
Unit (1 to 5)	Content	No. of Lectures (108)
1.	Case study or presentation on different types of servers.	
2.	Program on basic Tags a. Demonstrate the use of List Tags b. Demonstrate the use of block formatting Tags. c. Design web pages for your college containing a description of the courses, departments, teaching staff members. Use hyperlinks, list tags and img tags wherever necessary.	
3.	Program to create text based and graphic based navigation bars. a. Create hyperlinks and anchors in web document. b. Insert an image on the webpage and link another page to it. c. Create imagemaps with at least 2 hotspots of different shapes.	
4.	Demonstrate checkboxes, radio buttons, and various types of buttons in HTML5.	
5.	Design a web page embedding multimedia features. a. Insert an audio file to a web document. b. Insert a video file to a web document.	
6.	Program on Stylesheets. a. Demonstrate external stylesheets. b. Demonstrate the use ID and Class selector c. Demonstrate various types of stylesheets in a webpage. d. Demonstration on XSL	
7.	Programs on Javascript a. WAP to display tomorrow's date. b. WAP to accept a value from the user, display whether the number is odd or even. c. Design a basic calculator in javascript. d. Demonstrate any 5 string functions in Javascript. e. Demonstrate the onBlur, onFocus, onKeyPress and onMouseDown event handlers.	
8.	Programs on validations. a. Demonstrate the DOM and perform validations. b. WAP to demonstrate Ajax for simple validations.	
9.	Programs on PHP. a. Demonstrate any 5 string functions in PHP. b. Create an html page to accept first name, last name and age.	

	<p>Display the entered data in an PHP page.</p> <p>c. Demonstrate function with return values in PHP.</p> <p>d. WAP to display the following Binary Pyramid</p> <pre> 1 0 1 1 0 1 0 1 0 1 </pre> <p>e. WAP to find if the number is prime or not in PHP.</p> <p>f. WAP to demonstrate any 3 functions of Arrays in php.</p> <p>g. WAP to create a database named 'Records', having a table named 'Student' with column names Name, Course Name, Course ID, Incharge, and insert at least 7 rows. (Using mysql functions and PHP myAdmin)</p> <p>h. WAP to retrieve the rows where Course ID is BSC01 and display in a table.</p>	
10.	Demonstrate sessions and cookies.	

Course Code: US-SIT-P2

Practical III	Software Engineering	Total Credits: 2
U(1 to 4)	Content	No. of Lectures (108)
1.	Creation of SRS based on chosen case study & Application software development process model in chosen case study	
2.	Study and implementation of Entity Relationship Diagrams	
3.	Study and implementation of Data Flow Diagrams.	
4.	Study and implementation of Class diagrams	
5.	Study and implementation of Use Case Diagrams	
6.	Study and implementation of Sequence Diagrams	
7.	Study and implementation of State Transition Diagrams.	
8.	Study and implementation of. Activity Diagram	
9.	Study and implementation of Collaboration Diagrams, Component Diagrams & Deployment Diagrams.	
10.	Effort & Cost estimation (case study)	

Course Code: US-SIT-3P3

Practical III	Database Management System	Total Credits: 2
Unit (1 to 5)	Content	No. of Lectures (108)
1.	Creating and Managing Tables a. Creating and Managing Tables b. Including Constraints c. Perform DML insert statement	
2.	SQL Statements – 1 a. Writing Basic SQL SELECT Statements b. Restricting and Sorting Data c. Single-Row Functions, Datetime Functions	
3.	SQL Statements – 2 a. To study various keywords of SQL b. To study various options of LIKE predicate. c. To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.	
4.	SQL Statements – 3 a. Displaying data from Multiple Tables (Join). b. To apply the concept of Aggregating Data using Group functions. c. To solve queries using the concept of sub query.	
5.	Manipulating data a. Delete Statement b. Update Statement c. Database Trigger	
6.	Creating and managing other database objects a. Creating Views b. Other Database Objects c. Controlling User Access	
7.	PL/SQL Basics a. Declaring Variables b. Writing Executable Statements c. Interacting with the Oracle Server d. Writing Control Structures	
8.	Composite data types, cursors and exceptions. a. Working with Composite Data Types b. Writing Explicit Cursors c. Handling Exceptions	

9.	Procedures and Functions a. Creating Procedures b. Creating Functions c. Managing Subprograms d. Creating Packages	
10.	Security Privileges and Transaction Commands a. To apply the concept of security and privileges b. To study Transaction control commands.	

Course Code:US-SIT-3P4

Practical IV	Applied Mathematics	Total Credits: 2
Unit (1 to 5)	Content	No. of Lectures (108)
1.	Complex Number a. To add, subtract, multiply and divide two complex numbers. b. To solve given problem using de moivre theorem.	
2.	Laplace Transform & Inverse Laplace Transform a. To find Laplace transform of given function and plot the same. b. To find inverse Laplace transform.	
3.	To find solution of given differential equation.	
4.	Fourier Transform & Inverse Fourier Transform a. To find Fourier transform of given function and plot the same. b. To find inverse Fourier transform of given function and plot	
5.	Z Transform & Inverse Z Transform a. To find Z transform for given transfer function of system. b. To find transfer function from given Z Transform using inverse Z Transform and plot the same to check stability of the system.	
6.	Perform different Laplace operation on signal and plot them.	
7.	Obtaining Impulse response of the system and plot, using Laplace Transform.	
8.	Obtaining Impulse response of the system and plot, using Fourier Transform.	
9.	Obtaining Impulse response of the system and plot, using Z transform and Fourier Transform	
10.	Create mini project	

**The practical's will be based on the core subject Applied Mathematics using the Python/
Scilab programming solutions**

Course Code:US-SIT-3P5**Course Code:US-SIT-3P6**

Practical VI	Digital Marketing	Total Credits: 2
Unit (1 to 5)	Content	No. of Lectures (108)
1.	Defining a target group	
2.	Creating websites	
3.	Writing SEO content	
4.	SEO Optimization	
5.	Google Adwords	
6.	CRM Platform	
7.	Social Media Marketing Plan	
8.	Making a Facebook Page	
9.	Budgeting	
10.	Final Implementation	

Practical V	Android Programming	Total Credits: 2
Unit (1 to 5)	Content	No. of Lectures (108)
1.	Setting up Android Developer Mode, Booting into Android Recovery & Bootloader Mode.	
2.	Installation of Android Studio.	
3.	Creating First Application in Android Studio.	
4.	Creating Multi Activity Application with Graphics and Animations.	
5.	Creating Application with Firebase Database.	
6.	Installation of Ionic and required Components.	
7.	a. Creating First Application in Cordova b. Creating Mobile Friendly CSS Layout c. First AJAX page d. Using a CSS Framework	
8.	a. Button Overriding, Battery Status b. Camera, Device Orientation c. File System, Globalization d. Media Plugin	
9.	a. Multi Page Application b. Connecting to MySQL Database	
10.	Project.	

**Part 5- The Scheme of Teaching and Examination is as under:
Second Year Semester V Summary**

Sr. No.	Choice Based Credit System		Subject Code	Remarks
1	Core Course (Information Technology)		US-SIT-401, US-SIT-402, US-SIT-403, US-SIT-404.	
			US-SIT-4P1, US-SIT-4P2, US-SIT-4P3, US-SIT-4P4.	
2	Elective Course	Discipline Specific Elective (DSE) Course		
		2.1 Interdisciplinary Specific Elective (IDSE) Course		
		2.2 Dissertation/Project		
		2.3 Generic Elective (GE) Course		
3	Ability Enhancement Compulsory Courses (AECC)		--	
			--	
	Skill Enhancement Courses (SEC)		US-SIT-405 US-SIT-406	
			US-SIT-4P5 US-SIT-4P6	

**Second Year Semester -IV Internal and External Detailed Evaluation Scheme
Detail Scheme**

SN	Subject Code	Subject Title	Lectures Per Week (Lecture of 45 min)					Credit	Internals				Total Marks
			Units	SL*	L	T	P		SL E	CT+ AT= 15+5	PA	SEE	
1	US-SIT-401	Data Structures and Analysis	4	20%*	5	0	-	2	10	20	10	60	100
2	US-SIT-402	Data Communication and Networking	4	20%*	5	0	-	2	10	20	10	60	100
3	US-SIT-403	Software Testing and Quality Assurance	4	20%*	5	0	-	2	10	20	10	60	100
4	US-IT-404	(Dot).Net Technologies	4	20%*	5	0	-	2	10	20	10	60	100
5	US-SIT-405	Core Java	4	20%*	5	0	-	2	10	20	10	60	100
6	US-SIT-406	Data Analytics using R Programming	4	20%*	5	0	-	2	10	20	10	60	100
7	US-SIT-4P1	Practical Based US-SIT-401	-	-	0	-	3	2				50 (40+10)	50
8	US-SIT-4P2	Practical Based US-SIT-402	-	-	0	-	3	2				50 (40+10)	50

9	US-SIT-4P3	Practical Based US-SIT-403	-	-	0	3					50 (40+10)	50
10	US-SIT-4P4	Practical Based US-SIT-404				3	2				50 (40+10)	50
11	US-SIT-4P5	Practical Based US-SIT-405				3	2				50 (40+10)	50
12	US-SIT-4P6	Practical Based US-SIT-406				3	2				50 (40+10)	50
Total Lectures / Credit			(25+45) per week / 20				20					750

***One to two lectures to be taken for CONTINUOUS self-learning evaluation
Second Year Semester – IV Units – Topics – Teaching Hours**

S. N	Subject Code & Title	Subject Unit Title	Lect ures	Total Lecture	Credit	Total Marks
1	US-SIT-401	1 Introduction, Array.	15	60 L	2	100 (60+40)
		2 Linked List.	15			
		3 Stack, Queue, Graph.	15			
		4 Sorting Techniques, Tree, Advanced Tree Structures, Advanced Data Structures Overview, Hashing Techniques.	15			
2	US- SIT-402	1 Introduction, Network Models, Introduction to Physical layer, Digital and Analog transmission, Bandwidth Utilization, Transmission media, Switching.	15	60 L	2	100 (60+40)
		2 Introduction to the Data Link Layer, Introduction to Data Link Control, Media Access Control, Connecting devices and Virtual LANs, Virtual-Circuit Networks, Integrated Service Digital Networks- Narrowband, Broadband.	15			
		3 Introduction to the Network Layer, Unicast Routing, Next generation IP.	15			
		4 Introduction to the Transport Layer, Introduction to Application Layer, Multimedia.	15			
3	US-SIT-403	1 Introduction, Software Requirements, Software Processes: Software Development Process Models, Agile software development, Socio-technical system, Critical system, System Models, Requirements Engineering Processes.	15	60 L	2	100 (60+40)
		2 Architectural Design, User Interface Design, Process Improvement, Service Oriented Software Engineering, Software reuse, Distributed software engineering.	15			
		3 Introduction to Quality, Software Quality, Quality Engineering, Fundamentals & Principles of testing, Principles of Software Testing.	15			

		4	Unit Testing, Equivalence Class Testing, Decision Table-Based Testing, Path Testing, Data Flow Testing, Software Verification and Validation, Software Measurement, Software Cost Estimation, Software Maintenance.	15			
4	US-SIT-404	1	Introducing .NET, The C# Language, Types, Objects, and Namespaces, Windows Programing.	15	60 L	2	100 (60+40)
		2	Web Form Fundamentals, Form Controls / Server-Side Control, Error Handling, Logging, and Tracing.	15			
		3	Introduction & Routing, Data Management Technique and Model Layer, working with EF, Razor Views, Validations, MVC Caching, Bundling, Minification MVC Filter, ADO.NET Fundamentals.	15			
		4	Data Binding, The Data Controls, XML, ANGULAR JS, Angular Services, Routing and Single Page Applications, Angular Forms, Angular and Reactive JavaScript, Networking Essentials, ASP.NET, AJAX.	15			
5	US-SIT-405	1	Introduction, Java Operator, Loops and Control, Arrays and Strings, Introduction of Classes.	15	60 L	2	100 (60+40)
		2	Inheritance, Interface and Abstract, Packages.	15			
		3	Multithreading, Exceptions, Byte streams, Networking.	15			
		4	Event Handling, Abstract Window Toolkit & Layout, Introduction on Servlet.	15			
6	US-SIT-406	1	Introduction to R , Data preparation with R.	15	60 L	2	100 (60+40)
		2	Vector, Descriptive statistics & visualization with R	15			
		3	ANOVA, Linear regression with R.	15			
		4	Regressions & data preprocessing and visualization, Building interactive dashboards and predictive decision support tools with R.	15			
7	US-SIT-4P1		Practical based on US-SIT-401 Data Structures and Analysis		36 x3 batches= 108 lectures	2	50
8	US-SIT-4P2		Practical based on US-SIT-402 Data Communication and Networking		36 x3 batc hes= 108 lectures	2	50
9	US-SIT-4P3		Practical based on US-SIT-403 Software Testing and Quality Assurance		36 x3 batc hes= 108 lectures	2	50
10	US-SIT-4P4		Practical based on US-SIT-404		36 x3 batc		50

		(Dot).NET Technologies		hes= 108 lectures	2	
11	US-SIT-4P5	Practical based on US-SIT-405 Core Java		36 x3 batc hes= 108 lectures	2	50
12	US-SIT-4P6	Practical based on US-SIT-406 Data Analytics using R Programming		36 x3 batc hes= 108 lectures	2	50
		TOTAL			20	750

- Lecture Duration – 48 Minutes**
- One Credit =15 Hours**

Part 6: Detailed Scheme Theory

Curriculum Topics along with Self-Learning topics - to be covered, through self-learning mode along with the respective Unit. Evaluation of self-learning topics to be undertaken before the concluding lecture instructions of the respective unit

Course Code: US-SIT-401 Data Structures and Analysis

Unit	Content	No. of Lectures
1	<p>1.1 Introduction: Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure.</p> <p>1.2 Algorithm: Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation. (Case Study on Asymptotic Analysis and Notations)</p> <p>Non primitive datatypes, Types of data structures: Linear and Non-Linear.</p> <p>1.3 Array: Introduction, One Dimensional Array, Memory Representation of One-Dimensional Array, Traversing, Insertion, Deletion, Searching-Linear Search, Binary Search, Sorting: BubbleSort Merging of Arrays.</p> <p>1.4 Multidimensional Arrays, Memory Representation of Two-Dimensional Arrays, General Multi- Dimensional Arrays, Sparse Arrays, Sparse Matrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays.</p>	15
2	<p>2.1 Linked List: Introduction to Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List.</p> <p>2.2 Circular Linked List, Applications of Circular Linked List, Two way Linked List.</p> <p>2.3 Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays.</p>	15
3	<p>3.1 Stack: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion, Polish Expression.</p> <p>Reverse Polish Expression And Their Compilation, Tower of Hanoi.</p> <p>3.2 Queue: Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue, Some special kinds of queues, Deque, Priority Queue, Application of Priority Queue, Applications of Queues.</p> <p>3.3 Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked</p>	15

	Representation of Graph, Operations Performed on Graph, Graph Traversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.	
4	4.1 Sorting Techniques: Selection, Insertion, Merge Sort. 4.2 Tree: Tree, Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree, Binary tree traversal (Inorder, postorder, preorder, Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree. 4.3 Heap, Memory Representation of Heap, Operation on Heap, Heap Sort. 4.4 Advanced Tree Structures: Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree. 4.5 Advanced Data Structures Overview: Top-Down Splay Trees, Red-Black Trees, Deterministic Skip Lists, AA-Trees, Treaps. 4.6 Hashing Techniques: Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic, Double hashing, Bucket Hashing, Deletion and rehashing.	15

Self-Learning topics (Unit wise)

Unit	Topics
1.1	Primitive Data Types, Abstract Data Types, Data structure vs. File Organization
1.2	Case Study on Asymptotic Analysis and Notations)
2.3	Header Linked List, Applications of the Linked list
3.1	Applications of Stack,
3.2	Application of Priority Queue, Applications of Queues.
3.3	Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees

Online Resources

<https://nptel.ac.in/courses/106/103/106103069/>
<https://nptel.ac.in/courses/106/105/106105164/>

Reference Books:

US-SIT-401 Paper I

1. A Simplified Approach to Data Structures by Lalit Goyal, Vishal Goyal, Pawan Kumar, 1st Edition SPD, 2014.
2. Data Structure and Algorithm by Maria Rukadikar 1st Edition ,SPD 2017
3. Schaum's Outlines Data structure by Seymour Lipschutz, 2nd Edition, Tata McGraw Hill 2005
4. Data Structures and Algorithm Analysis in C++ by M. A. Weiss, Addison-Wesley, 3rd Edition

**Course Code: US-SIT-402 Data Communication and
Networking**

Unit.	Content	No. of Lectures
1	<p>1.1 Introduction: Data communications, networks, network types, Internet history, Protocol and standards and administration.</p> <p>1.2 Network Models: Protocol layering, TCP/IP protocol suite, The OSI model.</p> <p>1.3 Introduction to Physical layer: Data and signals, analog signals, digital signals, transmission impairment, data rate limits, performance.</p> <p>1.4 Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion.</p> <p>1.5 Bandwidth Utilization: Multiplexing and Spectrum Spreading: Multiplexing TDM, FDM, Spread Spectrum.</p> <p>1.6 Transmission and Transmission media: Guided Media, Unguided Media, Synchronous and asynchronous Transmission.</p> <p>1.7 Switching: Introduction, circuit switched networks, packet switching, structure of a switch.</p>	15
2	<p>2.1 Introduction to the Data Link Layer: Link layer addressing, Data Link Layer Design Issues, Error detection and correction, checksum, Cyclic Redundancy check code, forward error correction versus retransmission, Framing, Flow control, Flow And Error Control Protocols used.</p> <p>2.2 Introduction to Data Link Control: DLC services, data link layer protocols, HDLC, Point-to-point protocol.</p> <p>2.3 Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabit ethernet, IEEE Standard 802.3 Ethernet, 802.4 Token Bus, 802.5 Token Ring.</p> <p>2.4 Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Mobile IP.</p> <p>2.5 Connecting devices and Virtual LANs.</p> <p>2.6 Virtual-Circuit Networks: Frame Relay, ATM, ATM LANs versions of 802.11, 802.11a,802.11b,802.11g,802.11n, 802.11ac, OFDM, OFDMA.</p>	15
3	<p>3.1 Introduction to the Network Layer: Internet Protocol (IP): Datagram Format, Fragmentation and reassembly, Network layer services, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Address mapping, ARP, RARP, DHCP.</p> <p>3.2 Unicast Routing: Introduction, routing algorithms, unicast routing protocols- Distant Vector routing, Link State Routing, Path vector routing. Spanning tree, spanning tree algorithm, Multicast, Broadcast.</p> <p>3.3 Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.</p>	15

4	<p>4.1 Introduction to the Transport Layer: Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Sliding Window protocol, Go-Back-n protocol, Selective repeat protocol, , Selective reject protocol Bidirectional protocols), Transport layer services, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Congestion control.</p> <p>4.2 Introduction to Application Layer: World wide-web and HTTP, FTP, Electronic mail, MIME (Multipurpose Internet Mail Extension), Telnet, Secured Shell, Domain name system. SNMP.</p> <p>4.3 Multimedia: Digitizing Audio and Video, Audio and Video compression, RTP, RTCP, Voice over IP.</p>	15
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Self-Learning topics (Unit wise)

Sub Unit	Topics
1.6	Transmission and Transmission media: Guided Media, Unguided Media, Synchronous and asynchronous Transmission, Spread Spectrum
2.2	HDLC, Point-to-point protocol.
2.3	gigabit ethernet, IEEE Standard 802.3 Ethernet, 802.4 Token Bus, 802.5 Token Ring
2.6	versions of 802.11, 802.11a,802.11b,802.11g,802.11n, 802.11ac, OFDM, OFDMA
3.3	IPv6 addressing, ARP, RARP,
3.4	Selective repeat protocol, Selective reject protocol Bidirectional protocols Transport layer services
4.1	MIME (Multipurpose Internet Mail Extension), Domain name system. SNMP
4.3	RTP, RTCP

Online Resources

- [Computer Networks and Internet Protocol - Course \(nptel.ac.in\)](http://nptel.ac.in)
- [Computer Networks - Course \(swayam2.ac.in\)](http://swayam2.ac.in)
- [Sr.Secondary : Computer Science \(330\) - Course \(swayam2.ac.in\)](http://swayam2.ac.in)
- [Introduction to Wireless and Cellular Communications - Course \(nptel.ac.in\)](http://nptel.ac.in)
- [Demystifying Networking - Course \(nptel.ac.in\)](http://nptel.ac.in)
- [Introduction to Computer Networks & Internet Protocols - Course \(swayam2.ac.in\)](http://swayam2.ac.in)

Reference Books:

US-SIT-402 Paper II

1. Data Communication and Networking by Behrouz A. Forouzan, Tata McGraw Hill, Fifth Edition, 2013
2. TCP/IP Protocol Suite by Behrouz A. Forouzan , Tata McGraw Hill, Fourth Edition 2010
3. Computer Networks by Andrew Tanenbaum, Pearson, Fifth Edition 2013
4. Data Communication by William Stalling, Tata McGraw Hill, Fifth Edition

Course Code: US-SIT-403 Software Testing and Quality Assurance

Unit	Details	No. of Lectures
1	<p>1.1 Introduction to Quality: Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.</p> <p>1.2 Software Quality: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organization Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.</p>	15
2	<p>2.1 Fundamentals of Testing: Introduction, Necessity of testing, what is testing? Fundamental test process, the psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing.</p> <p>2.2 Principles of Software Testing: Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software.</p> <p>2.3 Testing Methodologies: Developing Test Strategy: Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches: Skills Required by Tester.</p> <p>Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing.</p>	15

<p>3</p>	<p>3.1 Unit Testing: Black Box Testing</p> <p>3.1.1 Boundary Value Analysis and Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Non-functional Boundaries, Functional Boundaries.</p> <p>3.1.2 Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Avoiding Equivalence Partitioning Errors, Composing Test Cases with Equivalence Partitioning, Equivalence Partitioning Exercise, Examples of Equivalence Partitioning and Boundary Values, Edge Testing, Guidelines and Observations.</p> <p>3.1.3 Decision Table-Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations.</p> <p>3.2 Path Testing: White Box Testing</p> <p>Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools.</p> <p>3.3 Software Verification and Validation: Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis of Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities.</p> <p>3.4 V-test Model: Introduction, V-model for software, testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities.</p>	<p>15</p>
<p>4</p>	<p>4.1 Levels of Testing: Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages.</p> <p>4.2 Special Tests: Introduction : GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing.</p> <p>4.3 Intersystem Testing : Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, 4.4 Object Oriented Application Testing : Testing of</p>	<p>15</p>

Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusiness eCommerce Testing, Agile Development Testing, Data Warehousing Testing.	
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Self-Learning topics (Unit wise):

	Topic
1.1	Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle,
1.2	Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Organization Culture, Characteristics of Software, Problematic Areas of Software Development Life Cycle,
2.1	The psychology of testing, Historical Perspective of Testing, Misconceptions About Testing,
2.2	Salient Features of Good Testing, Test Team Approach, Process Problems Faced by Testing,
2.3	Attitude Towards Testing (Common People Issues),
3.3	Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities. V-test Model
3.4	Introduction, V-model for software, testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities.
4.3	Risk Associated with New Technologies, Testing Adequacy of Control in New technology usage,

Online Resources

1. [NPTEL :: Management - NOC:Total Quality Management - I](#)
2. [NPTEL :: Management - NOC:Quality Design and Control](#)
3. [NPTEL :: Computer Science and Engineering - NOC:Software testing](#)
4. [NPTEL :: Computer Science and Engineering - NOC:Software Testing](#)

Reference Books:

US-SIT-403 Paper III

1. Software Testing and Continuous Quality Improvement by William E. Lewis, CRC Press, Third Edition, 2016
2. Software Testing: Principles, Techniques and Tools by M. G. Limaye, TMH, 2017.
3. Foundations of Software Testing by Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black, Cengage Learning, Third Edition.
4. Software Testing Technique by Boris Beizer, Dreamtech Press, Premier press 2014
5. Software Testing: A Craftsman's Approach by Paul C. Jorgenson, CRC Press, Fourth Edition 2017
6. Software Testing A Craftsman's approach by Paul C. Jorgensen, CRC Press, Second Edition 1997

Course Code: US-SIT-404 (Dot) .NET Technology

Unit	Content	No. of Lectures
1	<p>1.1 Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library.</p> <p>1.2 The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods.</p> <p>1.3 Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.</p> <p>1.4 Windows Programing: The Windows Forms Model, Creating Windows Forms Windows Forms Properties and Events, Windows Form Controls, Menus - Dialogs – ToolTip.</p>	15
2	<p>2.1 Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application.</p> <p>2.2 Form Controls / Server Side Control : Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.</p> <p>2.3 Error Handling, Logging, and Tracing: Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing.</p> <p>2.4 MVC Architecture: MVC Controllers, MVC Design Pattern, Working with Query Strings, MVC and API Controllers</p>	15
3	<p>3.1Introduction & Routing: Difference between ASP. Net web form and ASP.Net MVC, MVC Project structure, Create controller and view, Communication between controller and view, Routing mechanism flow</p> <p>3.2 Data Management Technique and Model Layer: Overview of Models and View Models, ViewData, ViewBag, TempData and Session; Scope of ViewData, ViewBag, TempData and Session</p> <p>3.3 Working with EF: Introduction, Entity Framework, Database-first vs Code-first, Changing the Model, Seeding the Database, Querying Objects.</p> <p>3.4 Razor Views: Understanding Razor Syntax, Page Structure with Layout Views, Settings Layout Defaults with _ViewStart, Using the ViewBag & ViewData, Adding Flexibility with Layout Sections, Reusing HTML with Partial Views, Passing Data across Requests with TempData.</p> <p>3.5 Validations: Introduction, Adding Validation, Styling Validation Errors , Data Annotations , Custom Validation , Validation Summary, Client-side Validation , Anti-</p>	15

	<p>forgery Tokens, Caching and Bundling. MVC Caching, Bundling, Minification.</p> <p>3.6 ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.</p>	
4	<p>4.1 Data Binding: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes.</p> <p>4.2 The Data Controls: Individual Components Label, Button, CheckBox, Radio Button, Choice, List, Menu, Text Field, Text Area</p> <p>4.3 XML: XML Explained, The XML Classes, XML Validation, XML Display and Transforms.</p> <p>4.4 ANGULAR JS: Overview Introduction to Angular; Angular Components, Structural Directives.</p> <p>4.5 Angular Services, Routing and Single Page Applications: Data Binding, MVVM Pattern, Angular Services, Single Page Applications, Angular Router: Parameters.</p> <p>4.6 Angular Forms, Angular and Reactive JavaScript: Angular Template-driven Forms, Angular Reactive Forms Angular Reactive Form Validation, Promises, Angular and RxJS.</p> <p>4.7 ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.</p>	15

Self-Learning topics (Unit wise)

Unit	Topics
1.2	The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods
1.3	Types, Objects, and Namespaces The Basics About Classes, building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.
4.3	XML: XML Explained, The XML Classes, XML Validation, XML Display and Transforms

Online Resources

1. [VB.NET Tutorial 15 - For Loop \(Visual Basic 2008/2010\) - Visual Basic .Net Videos \(nptelvideos.com\)](#)
2. [VB.NET Tutorial 3 - Variables \(Visual Basic 2008/2010\) - Visual Basic .Net Videos \(nptelvideos.com\)](#)
3. [NPTEL :: Computer Science and Engineering - Internet Technology](#)

Reference Books:

US-SIT-404 Paper IV

1. Beginning ASP.NET 4.5 in C# by Matthew MacDonald
2. Murach's ASP.NET 4.6 Web Programming in C# by Mary Dealmater, 2015
3. C# The Basics by Vijay Mukhi, BPB Publications
4. Asp.Net Visual C#.Net by Vijay Nicoel, TMH
5. Programming ASP.NET MVC 5, 2013

Course Code: US-SIT-405 Core Java

Unit	Content	No. of Lectures
1	<p>1.1 Introduction: History, architecture and its components, Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection, setting the path environment variable, Java Compiler And Interpreter, java programs, java applications, main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks, variables, variable name.</p> <p>1.2 Java Operator: Data types: primitive data types, Object Reference Types, Strings, Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.</p> <p>1.3 Loops and Control: Control statements for decision making: select statements (if statement, if ... else ... statement, if Else ... if ... statement, switch statement), goto statement, looping (while loop, do ... while loop and for loop), nested loops, breaking out of loops (break and continue statements), labeled loops.</p> <p>1.4 Arrays and Strings: One- and two-dimensional array, creating an array, strings, stringBuffer.</p> <p>1.5 Introduction of Classes: Defining a class, creating instance and class members: creating object of a class, accessing instance variables of a class, creating methods, naming methods of a class, accessing methods of a class, constructor, parameterized constructor, 'this' keyword, garbage collection, finalize method, methods overloading, constructor overloading, nested and inner classes, static member. Visibility control: public access, friendly access, protected access, private access, private protected access.</p>	15
2	<p>2.1 Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords.</p> <p>2.2 Interface and Abstract: Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces.</p> <p>2.3 Packages and Collection: Creating Packages, Default Package, Importing Packages, Using A Package. Collection Framework: Array List, LinkedList, HashSet, TreeMap, Enumeration, Queue.</p>	15
3	<p>3.1 Multithreading: The thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class.</p> <p>3.2 Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause.</p> <p>3.3 Byte streams: Reading console input, writing console output, reading file,</p>	15

	writing file, writing binary data, reading binary data, getting started with character stream, writing and reading file. 3.4 Networking: Introduction, Socket, Server socket, Client Server Communication.	
4	4.1 Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes. 4.2 Abstract Window Toolkit: Individual Components Label, Button, CheckBox, Radio Button, Choice, List, Menu, Text Field, Text Area. 4.3 Layout : Flow Layout, Grid Layout, Border Layout, Card Layout.	15

Self-Learning topics (Unit wise)

Unit	Topics
1.2	Java Operator: Data types: primitive data types, Object Reference Types, Strings, Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.
1.3	Loops and Control: Control statements for decision making : select statements (if statement, if ... else ... statement, if Else ... if ... statement, switch statement), goto statement, looping (while loop, do ... while loop and for loop), nested loops, breaking out of loops (break and continue statements), labeled loops
3.1	Multithreading The thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class
3.2	Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause

Online resources

1. [NPTEL :: Computer Science and Engineering - NOC:Programming in Java](#)

Reference Books:

US-SIT-405 Paper V

1. Java: The Complete Reference by Herbert Schildt, MCGrawHill 11th Edition, 2018
2. Java2 Programming - Black Book by Steven Holzner, Dreamtech Press, 5th Edition, 2006
3. Programming in Java by John Hubbard, Schaum Series, 2nd Edition 2019
4. Murach's beginning Java with Net Beans by Joel Murach , Michael Urban, Murach, 5th Edition 2018

Course Code: US-SIT-406 Data Analytics using R Programming.

Unit	Content	No. of Lectures
1	<p>1.1 Introduction to R: Overview and History of R, Install R, RStudio, R libraries Basics of R, RStudio.</p> <p>1.2 R Basics: Markdown Data types, operations Vectors, sequences, functions Import/export, summarize data Coding style. use of R as a calculator, functions and matrix operations, missing data and logical operators.</p> <p>1.3 Data preparation with R Transform data frames with mutate and map values Write user-defined functions Use if/else, for, while, apply, with Learn factors in R, lapply, tapply, split, mapply, apply, Coding Standards.</p>	15
2	<p>2.1 Vector: indexing, factors, Data management with strings, display and formatting. Data management with display paste, split, nd and replacement, manipulations with alphabets, evaluation of strings, data frames. Data frames, import of external data in various le formats, statistical functions, compilation of data.</p> <p>2.2 Descriptive statistics & visualization with R: Use plyr, ggplot2 libraries to make summary tables, graphs, and maps, 2/5 Hypothesis testing with R Test group mean differences (t-test, Chi squared test, non-parametric and other tests), Scoping Rules, Debugging Tools.</p>	15
3	<p>3.1 ANOVA: linear regression (OLS), binary/categorical independent. variables Diagnostics, output, and other post-estimation tables, graphs and iteration functions for simulations. Graphics and plots, statistical functions for central tendency, variation, skewness and kurtosis, handling of bivariate data through graphics, correlations, programming and illustration with example.</p> <p>3.2 Linear regression with R: Assess goodness of SIT, consider alternative functional forms, interaction effects, interpret results and evaluate model assumptions with statistic tests, tables and plots, Apply these techniques to a case study.</p>	15
4	<p>4.1 Regressions and data preprocessing and visualization: Learn conducting regression analyses with binary and count outcome variables Use more functions from plyr, ggplot2, dplyr packages.</p> <p>4.2 Building interactive dashboards and predictive decision support tools with R: Learn more models, packages, visualizations, Shiny dashboards Apply these techniques to a case study.</p>	15

Self-Learning topics (Unit wise)

Unit	Topics
1.1	Install R, RStudio, R libraries Basics of R,
1.2	sequences, use of R as a calculator
1.3	functions Use if/else, for, while, apply
2.1	Data management with strings, display and formatting , statistical functions, compilation of data.
2.2	Hypothesis testing with R
3.1	Linear regression (OLS)

3.2	evaluate model assumptions with statistic tests, tables and plots, Apply these techniques to a case study
4.1	regression analyses, ggplot2

Online resources

1. ugcmoocs.inflibnet.ac.in/ugcmoocs
2. [Descriptive Statistics With R Software - Course \(nptel.ac.in\)](http://Descriptive Statistics With R Software - Course (nptel.ac.in))
3. [Introduction To R Software - Course \(nptel.ac.in\)](http://Introduction To R Software - Course (nptel.ac.in))
4. [Advanced Engineering Mathematics - Course \(nptel.ac.in\)](http://Advanced Engineering Mathematics - Course (nptel.ac.in))

Reference Books:

US-SIT-406 Paper V

1. An Introduction to R by William N. Venables and David M. Smith, Network Theory Limited, 2nd Edition, 2009
2. The Art of R Programming - A Tour of Statistical Software Design by Norman Matloff, No Starch Press.2011
3. Getting started with R Studio by John Verzani, O'Reilly Media, 2011

Part 7 -Detailed Scheme Practical

Course Code: US-SIT-4P1

Practical I	Data Structures and Analysis	Total Credits: 2
Unit (1 to 4)	Content	No. of Lectures (108)
1.	Implementing Arrays <ol style="list-style-type: none"> a. Write a program in C++ to insert at least 10 elements in an 1D array and display them. b. Write a program to store the elements in 1-D array and perform the reversing of the elements. c. Read the two arrays from the user and merge them and display the elements in sorted order.[Menu Driven] 	
2.	Implementing 2D arrays in the following: <ol style="list-style-type: none"> a. Write a program to insert elements in a 5X5 matrix and display them in a sorted order. b. Write a program to perform the Matrix addition, Multiplication and Transpose Operation. [Menu Driven] 	
3.	Implementing the following: <ol style="list-style-type: none"> a. Write a program to perform Linear Search. b. Write a program to demonstrate Binary search c. Write a program to demonstrate Bubble Sort. 	

4.	Implement the following for Linked List: a. Write a program to create a single linked list with atleast 5 elements and display them. b. Write a program to search the elements in the linked list and display the same	
5.	Implement the following for Stack: a. Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations.(Menu Driven) b. Write a program to convert an infix expression to postfix and prefix conversion. c. Write a program to implement Tower of Hanoi problem.	
6.	Implement the following for Queue: a. Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations. (Menu Driven) b. Write a program to implement the concept of Circular Queue	
7.	Implement the following sorting techniques: a. Write a program to implement selection sort. b. Write a program to implement insertion sort. c. Write a program to implement merge sort. d. Comparative study of the above techniques.	
8.	Implementing Heaps a. Write a program to insert the element into maximum heap. b. Write a program to insert the element into minimum heap. Find the highest and the smallest number in a heap.	
9.	Implementing Hashing a. Write a program to implement the collision technique. c. Write a program to implement the concept of linear probing.	
10.	Case Study on graph with implementation of the following: a. Terminology b. Adjacency matrix. c. Traversal (BFS and DFS) b. Shortest path diagram.	

***Practicals can be performed using C++/Python**

Course Code: US-SIT-4P2

Practical II	Data Communication and Networking	Total Credits: 2
Unit (1 to 4)	Content	No. of Lectures (108)
1.	IPv4 Addressing and Subnetting a. Given an IP address and network mask, determine other information about the IP address such as: <ul style="list-style-type: none"> • Network address • Network broadcast address 	

	<ul style="list-style-type: none"> • Total number of host bits • Number of hosts <p>b. Given an IP address and network mask, determine other information about the IP address such as:</p> <ul style="list-style-type: none"> • The subnet address of this subnet • The broadcast address of this subnet • The range of host addresses for this subnet • The maximum number of subnets for this subnet mask • The number of hosts for each subnet • The number of subnet bits <p>The number of this subnet</p>	
2.	Use of ping and tracet / traceroute, ipconfig / ifconfig, route and arp utilities.	
3.	<p>a. Configure IP static routing.</p> <p>b. Implement Spanning tree algorithm</p>	
4.	<p>a. Configure IP routing using RIP.</p> <p>b. Implement broadcasting in the designed network</p>	
5.	Configuring Simple OSPF. Simulate given routing algorithm.	
6.	<p>a. Configuring DHCP server and client.</p> <p>b. Configuring DNS Server and client.</p>	
7.	Create virtual PC based network using virtualization software and virtual NIC.	
8.	Configuring OSPF with multiple areas.	
9.	Use of Wireshark to scan and check the packet information of following protocols HTTP, ICMP, TCP, SMTP, POP3	
10.	Compress the audio/video using given Compression algorithm. Implement RTP	

Course Code: US-SIT-4P3

Practical III	Software Testing and Quality Assurance	Total Credits: 2
Unit (1 to 4)	Content	No. of Lectures (108)
1.	Evaluating Test Exit Criteria and Reporting	
2.	Static and Dynamic Analysis	
3.	Rate Quality Attributes for Domain and Technical Testing	
4.	Draw State Graph	
5.	Incident Management	
6.	Path Testing and Equivalence Partitioning	
7.	Performance Testing	
8.	Using Testing Tool Selenium	

9.	Using Testing Tool QTP (Quick Test Professional) / UFT(Unified Functional Testing.)	
10.	Using Testing Tool WAPT	

Course Code: US-SIT-4P4

Practical IV	(Dot).NET Technology	Total Credits: 2
Unit (1 to 4)	Content	No. of Lectures (108)
1.	Create an application that obtains four int values from the user and displays the product.	
2.	<ul style="list-style-type: none"> a. C# Program to implement Phone Book b. C# Program to find a number using Pythagoras Theorem 	
3.	<ul style="list-style-type: none"> a. Create an application to demonstrate following operations <ul style="list-style-type: none"> i. Generate Fibonacci series. ii. Test for prime numbers. iii. Test for vowels. iv. Use of for each loop with arrays v. Reverse a number and find sum of digits of a number. b. Create simple application to perform following operations <ul style="list-style-type: none"> i. Finding factorial Value ii. Money Conversion iii. Quadratic Equation iv. Temperature Conversion 	
4.	Create a simple web page with various sever controls to demonstrate setting and use of their properties. (Example: AutoPostBack)	
5.	Working with Basic and Form Controls with Master Page and storing into database	
6.	Create a simple login form in MVC ASP.NET	
7.	Handle Routing in Angular Single Page Applications (SPAs) with JavaScript and Node.js	
8.	Working with data controls	
9.	Working with AJAX and XML	
10.	Programs to create and use DLL	

Course Code: US-SIT-4P5

Practical V	Core Java	Total Credits: 2
Unit (1 to 4)	Content	No. of Lectures (108)
1.	Write a Java program to create a Java class: (a) without instance variables and methods, (b) with instance variables and without methods, (c) without instance variables and with methods. (d) with instance variables	

	and methods.	
2.	Write a Java program that illustrates the concepts of selection statement, looping, nested loops, breaking out of loop.	
3.	Write a Java program to find GCD and LCM of two number	
4.	<p>Write a Java program to display the following pattern.</p> <p>a. ***** **** *** ** * b. A BC DEF GHIJ c. (a) (a + b) (a + b + c) (a + b + c + d) (a + b + c + d + e) (a + b + c + d + e + f) (a + b + c + d + e + f + g) (a + b + c + d + e + f + g + h) (a + b + c + d + e + f + g + h + i) d. 1 1 1 1 2 1 1 3 3 1 1 4 6 4 1</p>	
5.	Write a Java program to find the frequency of Character in a String	
6.	<p>Create a package We have to calculate the percentage of marks obtained in three subjects (each out of 100) by student A and in four subjects (each out of 100) by student B.</p> <p>Create an abstract class 'Marks' with an abstract method 'getPercentage'. It is inherited by two other classes 'A' and 'B' each having a method with the same name which returns the percentage of the students. The constructor of student A takes the marks in three subjects as its parameters and the marks in four subjects as its parameters for student B. Create an object for each of the two classes and print the percentage of</p>	

	marks for both the students.	
7.	<p>Create a class named 'Member' having the following members:</p> <p>Data members</p> <p>1 - Name</p> <p>2 - Age</p> <p>3 - Phone number</p> <p>4 - Address</p> <p>5 - Salary</p> <p>It also has a method named 'printSalary' which prints the salary of the members.</p> <p>Two classes 'Employee' and 'Manager' inherits the 'Member' class. The 'Employee' and 'Manager' classes have data members 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an employee and a manager by making an object of both of these classes and print the same.</p>	
8.	Demonstrate method overloading and method overriding in Java	
9.	Demonstrate creating your own exception in Java	
10.	Demonstrate Client and Server socket	

Course Code: US-SIT-4P6

Practical VI	Data Analytics using R Programming	Total Credits: 2
Unit (1 to 4)	Content	No. of Lectures (108)
1.	Write a program that prints Hello World to the screen.	
2.	<p>a. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n.</p> <p>b. Write a function that computes the running total of a list.</p>	
3.	Write a program that prints a multiplication table for numbers up to 12	
4.	Write a function that returns the largest element in a list.	
5.	Write program to perform linear regression. Use function call. Show the result graphically.	
6.	Write a function that tests whether a string is a palindrome.	
7.	Implement the following sorting algorithms: Selection sort, Insertion sort, Bubble Sort	
8.	<p>a. Implement linear search.</p> <p>b. Implement binary search.</p>	
9.	<p>a. To perform one way analysis of variance(one way ANOVA)</p> <p>b. To perform Two way analysis of variance(Two way ANOVA)</p>	
10.	<p>a. Implement matrices addition, subtraction and Multiplication</p> <p>b. Perform bivariate analysis of data using one way ANOVA. Show result graphically.</p>	