SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SILVER JUBILEE INSTITUTION

(*Affiliated to Bharathidasan University*)

(Accredited by NAAC | An ISO 9001:2015 Certified Institution)

SUNDARAKKOTTAI, MANNARGUDI – 614016, TAMILNADU, INDIA.

M.Sc., INFORMATION TECHNOLOGY

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK(CBCS-LOCF)

(***For the candidates admitted in the academic year 2023–2024***)

PROGRAMME CODE **2PSINT**

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CHOICE BASED CREDIT SYSTEM - LEARNINIG OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(For the candidates admitted in the academic year 2023-2024)

CHOICE BASED CREDIT SYSTEM

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Our College has moved to CBCS and implemented the grading system.

OUTCOME-BASED EDUCATION (OBE)
LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications are awarded on the basis of demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected of graduates of a programme of study. Learning outcomes specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. The expected learning outcomes are used as reference points that would help to formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes which in turn will help in curriculum planning and development, and in the design, delivery and review of academic programmes. They provide general guidance for articulating the essential learnings associated with programmes of study and courses with in a programme, maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility and provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing student learning levels, and periodic review of programmes and academic standards.

Some important aspects of the Outcome Based Education

Course: is defined as a theory, practical or theory cum practical subject studied in a semester.

Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.

Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs): PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC): A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE): Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

Generic Elective Courses: An elective course chosen generally from an **unrelated discipline/subject,** with an intention to seek exposure is called a Generic Elective. Generic Elective courses are designed for the students of other disciplines. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Non Major Elective (NME): A student shall choose at least two Non-major Elective Courses (NME) from outside his/her department.

Skill Enhancement Courses (SECs): These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge**.**

Field Study/Industrial Visit/Case Study: It has to be completed during the fifth semester of the degree programme. Credit for this course will be entered in the fifth semester's marks statement.

Internship: Students must complete internship during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. Credit for internship will be entered in the fifth semester's mark statement.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTELetc.

Postgraduate Programme:

Programme Pattern: The Post Graduate degree programme consists of **FIVE** vital components. They are as follows:

Part –A	:	Core Course (Theory, Practicals) Core Industry Module, Core Project
Part-B (i)	:	Elective courses
Part-B (ii)	:	Non Major Elective, Skill Enhancement course, Professional Competency course
Part-B (iii)	:	Internship
Part –C	:	Extension activity

EXAMINATION

Continuous Internal Assessment (CIA):

PG - Distribution of CIA Marks

Passing Minimum: 50 %

Assignments – 3 = 30%

Tests- 2 = 50%

Seminar=10 %

Attendance= 10 %

Question Paper Pattern

Part A: includes two subsections

Part A 1 (10X1=10 marks)

One word question/ Fill in/True or False/ Multiple Choice Questions

Two Questions from Each unit

Part A 2(5X2=10 marks)

Match the following

Short Answers

One question from Each unit

Total Marks - 20

Part B: (5X5=25 marks)
Paragraph Answers
Either/ or type
One Question from each unit

Part C: (10X3=30)
Essay Type Answers
Answer 3 out of 5 Questions
One Question from each unit

Part A: K1 Level
Part B: K2, K3 and K4 Level
Part C: K5 and K6 Level

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S.No.	Level	Parameter	Description
1	K1	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/ Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis/Creating	The learner creates a new product or point of view

WEIGHTAGE of K –LEVELS IN QUESTION PAPER

(Cognitive Level) K-LEVELS→	Lower Order Thinking			Higher Order Thinking			Total
	K1	K2	K3	K4	K5	K6	
END SEMESTER EXAMINATIONS (ESE)	20	25			30		**75**
Continuous Internal Assessment (CIA)	20	25			30		**75**

QUESTION PATTERN FOR END SEMESTER EXAMINATION/ Continuous Internal Assessment		
PART		**MARKS**
PART –A I. (No choice ,One Mark) **TWO** questions from each unit **II.** (No choice, Two Mark) **ONE** question from each unit	(10x1=10) (5x2=10)	**20**
PART –B (Either/ or type,5-Marks) **ONE** question from each unit	(5x5=25)	**25**
PART –C (3 out of 5) (10Marks) **ONE** question from each unit	(3x10=30)	**30**
	Total	**75**

BLUE PRINT OF QUESTION PAPER FOR END SEMESTER EXAMINATION							
DURATION: 3.00 Hours.							**Max Mark :75**
K-LEVELS / **PART**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**Total Marks**
PART –A (One Mark, No choice) (10x1=10)	10						**10**
(2-Marks,No choice) (5x2=10)	10						**10**
PART –B (5-Marks)(Either/or type) (5x5=25)		5	10	10			**25**
PART –C (10 Marks)(3 out of 5) (3x10=30) Courses having only **K5,K6** levels, K5 level- 3 Questions, K6 level- 2 Questions **(One K6 level question is compulsory)**					20	10	**30**
Total	**20**	**05**	**10**	**10**	**20**	**10**	**75**

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

Grade Point Average (GPA) will be calculated from the first semester onwards for all semester. From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA), respectively. These two are calculated by the following formulae:

$GPA = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{I=1}^{n} C_i}$	$WAM(\text{Weighted Average Marks}) = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{I=1}^{n} C_i}$
Where, C_i is the Credit earned for the Course$i$ G_i is the Grade Point obtained by the student for the Course$i$ M_i is the marks obtained for the course$i$ and n is the number of Courses **Passed** in that semester.	

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

i. The classification of final results shall be based on the CGPA, as indicated in Table-2.

ii. For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99 and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good', and 'Above Average' respectively.

iii. Absence from an examination shall not be taken an attempt.

Table- 1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	**10**	**O**
80 and above and below 90	**9**	A+
70 and above and below 80	**8**	**A**
60 and above and below 70	**7**	**B+**
50 and above and below 60	**6**	**B**
Below50	**NA**	**R A**

NA- Not Applicable, RA- Reappearance

The candidates performance in every current semester is indicated by **Semester Grade Point Average (SGPA)** andfrom the second semester onwards, the continuous performance including previous semester/s is indicated by **Cumulative Grade Point Average (CGPA)**

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	**O**	**Outstanding**
8.00 to 8.99	A +	**Excellent**
7.00 to 7.99	**A**	**Very Good**
6.00 to 6.99	**B +**	**Good**
5.00 to 5.99	**B**	**Above Average**

***** The candidates who have passed in the first appearance and within the prescribed duration of the PG Programmeareeligible. If the candidate's Grade is O/A+ with more than one attempt, the performance is fixed as "Very Good"

Vision

Attaining Global Recognition in Computer Science Education and to Develop the Software Professionals

Mission

Imparting Quality Education through a Well – Designed Curriculum in tune with the Challenging Software Needs of the Industry

PROGRAMME OUTCOMES FOR M.Sc.,DEGREE PROGRAMMES

PO.No	Programme Outcomes (*Upon completion of the M.Sc.,DegreeProgramme, the Post graduate will be able to)*
PO-1	**Disciplinary Knowledge**: demonstrate in-depth knowledge and understanding of theories, policies, and practices in one or more disciplines that form a part of a Post Graduate program of study in Master of Science.
PO-2	**Critical Thinking and Problem Solving**: apply analytic thought to a body of knowledge, analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence, identify relevant assumptions or implications, formulate coherent arguments, critically evaluate practices, policies and theories by following scientific approach to knowledge development: solve problems and extrapolate the same to real life situation
PO-3	**Information/digital literacy and Communication Skills:** use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources, and use appropriate software for analysis of data: communicate thoughts and ideas analytically and effectively in writing and orally using appropriate media, and present complex information in a clear and concise manner to different groups.
PO-4	**Research-related skills:** conduct independent inquiry in a chosen scientific discipline, demonstrate sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; plan, execute and report the results of an experiment or investigation.
PO-5	**Scientific reasoning and Reflective Thinking:** analyse, interpret and draw conclusions from quantitative/qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective; critically and sensibly evaluate life experiences, with self awareness and reflexivity of both self and society.
PO-6	**Multidisciplinary Approach, Innovation and Entrepreneurship:** propose novel ideas of interdisciplinary approach in providing better solutions and new ideas for the sustainable developments; identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.
PO-7	**Moral and ethical awareness/reasoning:** embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work, demonstrate the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights, appreciate environmental and sustainability issues, and adopt objective, unbiased and truthful actions in all aspects of work.
PO-8	**Self directed Learning:** work independently, identify appropriate resources required for a project, and manage a project till completion.
PO-9	**Lifelong Learning:** engage in continuous learning for professional growth and development, acquire knowledge and skills, adapt to changing environment and to changing trades and demands of work place through knowledge/skill development/reskilling.
PO-10	**Multicultural Competence, Social Interaction and Effective Citizenship:** understand the values and beliefs of multiple cultures, global perspectives, engage and interact respectfully with diverse groups and elicit views of others, mediate disagreements and help reach conclusions in group settings, and demonstrate empathetic social concern and equity centred national development

M.Sc., INFORMATION TECHNOLOGY-PROGRAMME SPECIFIC OUTCOME

PSO No.	Program Specific Outcomes (M.Sc., Information Technology)
PSO1:	Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
PSO2:	Gain critical understanding of hardware and software tools catering to the contemporary needs of IT industry
PSO3:	Design, Develop and test software systems for worldwide network of computer to provide solutions to real world problems.
PSO4:	Apply standard software engineering principles to develop viable solutions for information technology enabled services.
PSO5:	Analyze and recommend the appropriate IT infrastructure required for the implementation of a project.
PSO6:	Implement the business ideas in IT industry through e-commerce and Management information system concepts.
PSO7:	An ability to understand research methods used to collect and analyze data for decision making.

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M.Sc., INFORMATION TECHNOLOGY

COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM - LEARNINIGOUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(Applicable to the candidates admitted form the academic year 2023-2024)

ELIGIBILITY: B.C.A. / B.Sc. Computer Science / B.Sc. Information Technology / B.Sc. Software Development or any other degree (with Mathematics as an allied subject / Major subject) or (ComputerScience with Mathematics or Business Mathematics or Statistics at +2 level) of this University or from arecognized University or an examination accepted by the Syndicate as equivalent thereto

Sem	Part	Course	Course Code	Title of the Paper	Ins. Hours/ Week	L	T	P	S	Credit	Exam Hours	Marks		Total
												CIA	ESE	
I	Part A	Core Course- I	P23IT101	Python programming	6	4	1	-	1	5	3	25	75	100
		Core Course- II	P23IT102	Cryptography And Network Security	6	4	1	-	1	5	3	25	75	100
		Core Practical- I	P23IT103P	Python Programming Lab	6	-	-	6	-	3	3	25	75	100
	Part B(i)	Elective Course- I	P23ITE11A/ P23ITE11B/ 23ITE11C	Mobile Computing/ Principles of Compiler Design/ Social Networking	5	5	-	-	-	3	3	25	75	100
		Elective Course- II	P23ITE12A/ P23ITE12B/ P23ITE12C	Pervasive Computing/ Advanced Data Structures/ Object Oriented Systems Development	5	4	1	-	-	3	3	25	75	100
	Part B (ii)	NME-I			2	2	-	-	-	2	-	25	75	100
				TOTAL	**30**	**19**	**3**	**6**	**2**	**21**	-	-	-	**600**

Sem	Part	Course	Course Code	Title of the Paper	Ins. Hours/ Week	L	T	P	S	Credit	Exam Hours	Marks		Total
												CIA	ESE	
II	Part A	Core Course- III	P23IT204	Advanced Database Systems	6	4	1	-	1	5	-	25	75	100
		Core Course- IV	P23IT205	Open-Source Technologies	6	4	1	-	1	5	-	25	75	100
		Core Practical- II	P23IT206P	RDBMS Lab	6	-	-	6	-	3	-	25	75	100
	Part B(i)	Elective Course- III	P23ITE23A/ P23ITE23B/ P23ITE23C	Biometrics Techniques/ Digital Watermarking and Steganography/ Digital Image Processing	5	5	-	-	-	3	-	25	75	100
		Elective Course- IV	P23ITE24A/ P23ITE24B/ P23ITE24C	Human Computer Interaction/ Computer Security and Privacy/ Operating Systems	5	4	1	-	-	3	-	25	75	100
	Part B (ii)	NME-II			2	2	-	-	-	2	3	25	75	100
	Part B (iii)	Internship/Industrial Activity			-	-	-	-	-	-	-	-	-	-
				TOTAL	**30**	**19**	**3**	**6**	**2**	**21**	-	-	-	**600**
III	Part A	Core Course-V	P23IT307	J2EE Technologies	6	4	1	-	1	5	3	25	75	100
		Core Course-VI	P23IT308	Software Engineering	6	4	1	-	1	5	3	25	75	100
		Core Practical-III	P23IT309P	J2EE Technologies Lab	6	-	-	6	-	3	3	25	75	100
		Core Industry Module	P23ITI31	Data Analytics	5	4	1	-	-	3	3	25	75	100
	Part B (i)	Elective Course- V	P23ITE35A/ P23ITE35B/ P23ITE35C	Research Methodology / Intelligent Systems/ Virtual and Augmented Reality	5	4	1	-	-	3	3	25	75	100
	Part B (ii)	Skill Enhancement Course	P23SEIT31	Animation in Flash	2	2	-	-	-	2		25	75	100
	Part B (iii)	Internship/Industrial Visit			-	-	-	-	-	2	-	-	-	-
		TOTAL			**30**	**18**	**4**	**6**	**2**	**23**	**-**	**-**	**-**	**600**

Sem	Part	Course	Course Code	Title of the Paper	Ins. Hours/ Week	L	T	P	S	Credit	Exam Hours	Marks		Total
												CIA	ESE	
IV	Part A	Core Course- VII	P23IT410	Dot Net	5	4	1	-	-	5	-	25	75	100
		Core Course- VIII	P23IT411	Artificial Intelligence	5	4	1		-	5	-	25	75	100
		Core Practical-IV	P23IT412P	Dot Net Lab	6	-	-	6	-	3	-	25	75	100
		Core Project	P23ITPW	Project with Viva Voce	8	-	2	6	-	7	-	25	75	100
	Part B(i)	Elective Course- VI (Industry/ Entrepreneurship)	P23ITE46A/ P23ITE46B/ P23ITE46C	Internet of Things / Trends in Computing/ Introduction to Robotics	4	3	1	-	-	3	-	25	75	100
	Part B (ii)	Professional Competency Course	P23PCIT41	Computer Science for NET/SET	2	2	-	-	-	2	3	25	75	100
	Part C	Extension Activity			-	-	-	-	-	1	-	-	-	-
				TOTAL	**30**	**13**	**5**	**12**	**-**	**26**	**-**	**-**	**-**	**600**
		GRAND TOTAL			**120**	-	-	-	-	**91**				**2400**
*** Extra Credit**				**MOOC/SWAYAM/NPTEL (Atleast one)**	**-**	-	-	-	-	**2**	-	-	**-**	**-**
				Value Added Courses (Atleast one per year)	**-**	-	-	-	-	**2**	-	-	**-**	**-**

CREDIT DISTRIBUTION FOR M.SC., INFORMATION TECHNOLOGY

S.No	Part	Subject	Total Credits
1	Part A	Core Course [8 Courses X 5 Credits]	40
2		Core Practical [4 Courses X 3 Credits]	12
3		Core Project Work VIVA VOCE	7
4		Core Industry Module	3
5	Part B (i)	Elective Course [6 Courses X 3 Credits]	18
6	Part B (ii)	Non Major Elective [2 Course X 2 Credits]	4
7		Skill Enhancement Course [1 Courses X 2 Credits]	2
8		Professional Competency Course [1 Course X 2 Credits]	2
9	Part B (iii)	Internship/ Industrial Visit	2
10	Part C	Extension Activity	1
Total Credit			**91**

Part A component and Part B (i) will be taken into account for CGPA calculation for the postgraduate programme and the other components of Part B and Part C have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the PG degree.

NON MAJOR ELECTIVE (NME) OFFERED BY THE DEPARTMENT

Semester	Part	Course	Course Code	Title of the Paper
I	Part B (ii)	NME-I	P23NMEIT11	Web Design
II		NME-II	P23NMEIT22	Multimedia and its Applications

VALUE ADDED COURSE(VAC) OFFERED BY THE DEPARTMENT

Semester	Part	Course	Course Code	Title of the Paper
II	Extra credit course	VAC-I	P23ITVA21	Green Computing
III		VAC-II	P23ITVA32	Fundamentals of Information Security

SEMESTER III

M.Sc., INFORMATION TECHNOLOGY
Semester: III–CC-V- J2EE TECHNOLOGIES

Ins. Hrs./Week: 6 **Course Credit: 5** **Course Code:P23IT307**

UNIT I Client – Server Architecture **(18 Hours)**

Introduction – Distributive Systems – Real Time Transmission – Software objects – Web Services –The Tier – Client, Resources and Components – Accessing Services - J2EE Multi-Tier Architecture– J2EE Best Practices – Clients – Client Presentation – Client Input Validation- Client Control- Duplicate Client Request- Session Management- Client-side Session State – Server-side Session State.

UNIT II Presentation Services **(18 Hours)**

Java and XML – Generating an XML Document – Parsing XML- Document Object model (DOM)- Simple API for XML (SAX)- Java Servlets – Java Servlets and Common Gateway Interface Programming-Benefits of Using a Java Servlet – A Simple Java Servlet- Anatomy of a Java servlet - Java Server Pages-JSP Installation – JSP Tags – Tomcat – Request String-User Sessions – Cookies –Session Objects.

UNIT III Interaction Services **(18 Hours)**

Enterprise Java Beans – EJB Container – EJB Classes – EJB Interfaces - Deployment Descriptors – Session Java Bean – Stateless Vs Stateful – Creating a Session Java Bean - Entity Java Bean – Message Driven Bean – The JAR File -Java Mail – Java Remote Method Invocation – Remote method Invocation Concept-Server Side – Client Side.

UNIT IV Security Services **(18 Hours)**

Java Message Service – JMS Fundamentals – Components of a JMS Program – Messages – Message Selector – Sending Message to a Queue – Receiving Message from a Queue – Compiling and Running Queue Programs – Creating a Publisher – Creating a Subscriber – Security – J2EE Security Concepts–JVM Security – Security Management – Java API Security – Browser Security – Web Services Security-Web Services Security Classifications – Security Within a WebServices Tier- Programmatic Security.

UNIT V J2EE Databases **(18 Hours)**

J2EE Database Concepts – Data – Database – JDBC Objects – Database Connection – The Connection– Timeout - JDBC and Embedded SQL – Tables – Inserting Data into Tables – Selecting Data from a Table – Updating Tables – Deleting Data from Table.

Total Lecture Hours:90

COURSE OUTCOMES

Upon successful completion of this course, students will be able to

1. Develop own Web applications with various available resources
2. Understand different open-source frameworks
3. Evaluate Java Runtime Environment and Java Virtual Machine
4. Familiarize the concept of J2EE Architecture and Specifications
5. Effectively use J2EE Databases

TEXT BOOK(S)

1. James Holmes, "The Complete References Struts Second Edition", Tata McGraw Hill Edition, India, 2007.
2. Jim Keogh, "The Complete Reference J2EE", Tata McGraw – Hill Edition, India, 2002.

REFERENCE BOOK(S)

1. Jusin Couch, Daniel H. Steinberg, "J2EE Bible", Wiley India (P) Ltd, New Delhi, 2002.
2. Paul Tremblett,"Instant Enterprise Java Y-Beans", Tata McGraw Hill Publishing Company, NewDelhi. 2001.
3. Rick Cattell, "J2ee Technology in Practice: Building Business Applications with the Java 2Platform", Enterprise Edition (Enterprise), Addison-Wesley Professional, Bostan, USA, 2001.

E_RESOURCES

1. http://ptgmedia.pearsoncmg.com/imprint_downloads/informit/sun/032124575X.pdf
2. https://www.lnjpitchapra.in/wp-content/uploads/2020/03/file_5e817ee54956f.pdf
3. https://people.engr.ncsu.edu/efg/517/f02/common/syllabus/lectures/lec21.pdf

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3	2	2
CO2	3	2	3	2	2	3	3	3	2	2	2	3	2	3	3	2	3
CO3	3	3	2	3	3	3	3	2	3	2	2	2	2	3	3	3	2
CO4	3	2	3	2	3	2	3	3	2	2	2	3	3	3	2	3	3
CO5	3	3	2	3	3	3	2	2	3	3	3	2	3	2	2	2	2

S-Strong (3) M-Medium (2) L-Low (1)

M.Sc., INFORMATION TECHNOLOGY

Semester: III- CC-VI - SOFTWARE ENGINEERING

Ins. Hrs. /Week: 6 **Course Credit: 5** **Course Code:P23IT308**

UNIT I Need for S/w Engineering (19 Hours)

About software and S/w engineering – A systems approach – Engineering approach – Members of the development team – Change in S/w engineering. - **Modeling the process and Life cycle**: The meaning of process – S/w process models– Tools and techniques for projects modeling – Practical process modeling.

UNIT II Planning and managing the process (20 Hours)

Tracking progress -Milestones-Difference between milestone and activity- Work breakdown and Activity Graphs- Activity Graph- Estimating completion- Tools to track progress-**Project personnel** : Staff roles and characteristics- Work styles- Rational extroverts- **Project Organization**: Chief programmer team- Egoless Approach-**Effort estimation**: Facilities Expert Judgement- Delphi Technique- Algorithmic Methods- COCOMO Model- Machine learning methods - **Risk management**: Risk Management Activities -The project plan-process models and project management.

UNIT III Capturing the requirements (17 Hours)

The requirement process – Types of Requirements – Characteristics of requirements – Modeling Notations-Prototyping requirements – Requirements Documentation –validation and verification – Measuring requirements – Choosing a requirements specification Techniques.

UNIT IV Designing the system (17 Hours)

Design Introduction - Modeling the Architectures-Decomposition and views – Architectural styles and strategies – Achieving Quality Attributes-Collaborative Design - Architectural Evaluation and Refinement - Documenting software Architectures – Programming standards and procedures – Programming guidelines – Documentation.

UNIT V Software Testing and Maintenance (17 Hours)

Testing strategic issues – Test strategies for conventional S/w – Test strategies for object-oriented S/w – Validation testing – System testing – S/w testing. Fundamentals – Black-box and White-box testing – White box testing – Black box testing – Mccall's Quality factors – ISO 9126 - QF– S/w engineering – S/w Maintenance.

Total Lecture Hours : 90

COURSE OUTCOMES

The students will be able to,

1. Describe software engineering layered technology and Process frame work
2. Analyze the role of project management including planning, scheduling, risk management, etc.
3. Analyze implementation issues such as modularity and coding standards.
4. Understand of approaches to verification and validation including static analysis, and reviews.
5. Understand of software testing approaches such as unit testing and integration testing.

TEXT BOOK(S)

1. Roger S. Pressman,"Software Engineering A Practitioner's Approach", 6th Edition, TataMcGraw Hill Publication, New Delhi, India. [(for Unit 5) Chapters : 13, 14, 15, 31]
2. Shari Lawrence P. Fleeger, "Software Engineering Theory and Practice", 2nd Edition, PearsonEducation, Delhi, 2001. [(for Units 1–4) Chapters 1, 2, 3, 4, 5, 7]

REFERENCE BOOK(S)

1. Douglas Bell, "Software Engineering for Students-A Programming Approach", 4th Edition, Pearson Education, Delhi, 2007.
2. Ian Sommerville, "Software Engineering", 6th Edition, Pearson Education, Delhi, 2005.
3. Rajib Mall, "Fundamentals of Software Engineering",5 th Edition, PHI learning, Delhi.

E_RESOURCES

1. https://books.google.com/books/about/Software_Engineering.html?id=fadQAAAAMAAJ
2. http://hello.joolz.com/download/pressman-r-software-engineering-a-practitioners-approach-7th- edition- tata-mcgraw-hill-book_pdf
3. https://www.tutorialspoint.com/sdlc/index.html

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2	2	3
CO2	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO3	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO4	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2	2	3
CO5	3	3	3	2	3	3	3	2	3	3	3	3	3	3	2	2	3

S-Strong (3) M-Medium (2) L-Low (1)

Semester: III–CP-III - J2EE TECHNOLOGIES LAB

Ins. Hrs. /Week: 6 **Course Credit: 3** **Course Code:P23IT309P**

EXERCISES

1. To find the marks of the students using Remote Method Invocations.
2. To write a Servlet program to calculate the bonus of an employee
3. To write a Servlet program to implement Session Tracking.
4. To write a Servlet program to check authentication for user using Cookies.
5. To write a Servlet program and use JDBC in it.
6. To write a simple program for JSP.
7. To write a JSP program that works with JDBC.
8. To write a JSP Program with Bean Class.
9. To write a EJB Stateless Program to create bonus of an employee.

Total Lecture Hours : 90

COURSE OUTCOMES

The Students will be able to,

1. To master the whole process of designing, implementing, and deploying J2EEApplications.
2. To implement and access web service components using EJB in java EE Applications.
3. To understand the concept of Servlet.
4. To know about the concept of Core Java.
5. Understanding different open source formats

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	2	2	2	3	3	3	2	2	2	3	3	3	2	2
CO2	2	3	2	3	3	3	2	2	3	3	3	2	3	3	3	3	2
CO3	3	3	2	3	3	3	2	2	2	3	3	3	3	3	3	3	3
CO4	2	3	2	3	3	3	2	2	2	3	3	3	2	2	2	3	3
CO5	3	2	3	2	2	3	3	3	3	2	2	3	2	2	2	2	3

6. **S-Strong (3)** **M-Medium (2)** **L-Low (1)**

Semester: III - Core Industry Module - DATA ANALYTICS

Ins.Hrs./Week:5 **Course Credit: 3** **Course Code: P23ITI31**

UNIT I Types Of Digital Data **(13 Hours)**

Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, Data environment versus big data environment.

UNIT II Data Analytics **(16 Hours)**

Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment.

UNIT III Big Data Technologies And Databases **(15 Hours)**

Introduction to NoSQL, Uses, Features and Types, Need, Advantages, Disadvantages and Application of NoSQL, Overview of NewSQL, Comparing SQL, NoSQL and NewSQL, Introduction to MongoDB and its needs, Characteristics of MongoDB, Introduction of apache Cassandra and its needs, Characteristics of Cassandra.

UNIT IV Hadoop Foundation For Analytics **(15 Hours)**

History, Needs, Features, Key advantage and Versions of Hadoop, Essential of Hadoop ecosystems, RDBMS versus Hadoop, Key aspects and Components of Hadoop, Hadoop Architectures.

UNIT V Hadoop Mapreduce And Yarn Framework **(16 Hours)**

Introduction to MapReduce, Processing data with Hadoop using MapReduce, Introduction to YARN, Components, Need and Challenges of YARN, Dissecting YARN, MapReduce application, Data serialization and Working with common serialization formats, Big data serialization formats.

Total Lecture Hours:75

COURSE OUTCOMES

The students will be able to,

1. Outline the basics in data science
2. Demonstrate the knowledge of data analysis techniques in decision making
3. To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools
4. To collaborate, apply and review the computing for big data in Hadoop, and NoSQL environment
5. To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, MongoDB, HIVE and PIG

TEXT BOOK(S)

1. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2016.

REFERENCE BOOK(S)

1. Anand Rajaraman, Jure Leskovec, Jeffery D. Ullman "Mining of Massive Datasets", , Springer, July 2013.
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, "Big Data" Wiley Publications, 2014.
3. Mohanty, Madhu Jagadeesh and Harsha Srivatsa, Apress Media, Springer Science + Business Media New York, 2013
4. Soumendra "Big Data Imperatives : Enterprise Big Data Warehouse, BI Implementations and Analytics"
5. Tom White, "Hadoop: The definitive Guide", O'Reilly Media, 2010.

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1. http://www.thearling.com/text/dmwhite/dmwhite.htm
2. http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=AD0770256
3. https://www.datamentor.io/r - programming#tutorial
4. http://www.csis.pace.edu/~ctappert/cs816- 15fall/books/2015DataScience&BigDataAnalytics.pdf
5. http://www.rdatamining.com/
6. https://www.analyticsvidhya.com/blog/2016/02/complete - tutorial - learn - data - science - scratch/
7. https://www.tutorialspoint.com/data_mining/dm_classification_prediction.htm (Classification)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	3	2	2	3	3	3	3	3	3	3	2	3	3	3
CO2	3	3	3	3	3	3	2	3	3	2	3	2	3	3	3	3	2
CO3	3	2	3	3	2	2	3	3	3	3	2	3	2	2	2	2	3
CO4	3	3	3	3	3	3	2	2	3	2	3	2	3	3	3	3	2
CO5	3	3	3	3	3	3	3	2	3	3	3	2	3	3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

Semester: III–EC-V(a) - RESEARCH METHODOLOGY

Ins. Hrs. /Week: 5 **Course Credit:3** **Course Code:P23ITE35A**

UNIT I Research Fundamentals **(15 Hours)**

Motivation and Objectives – Research Methods and Methodology - Research types – Descriptive Vs Analytical, Applied Vs Fundamental, Quantitative Vs Qualitative, Conceptual Vs Empirical, concept of applied and Basic research process – Criteria of good Research.

UNIT II Research Formulation and Problems **(15 Hours)**

Defining and formulating the Research problem – Selecting the problem – Necessity of defining the problem – Importance of Literature review in defining a problem – Literature collection - Literature review – Primary and secondary sources – Reviews – Monograph – Patents – Research Databases – Web as a source – Searching the web – Critical literature review – Identifying gap areas from literature and research database, Development of working hypothesis.

UNIT III Thesis Writing **(15 Hours)**

Writing review and journal articles – manuscript publication - **Thesis Writing**: Planning a thesis – general format – page and chapter format – footnotes – tables and figures–references and appendices. Research Tools in Computer Science: LaTex, R, WEKA, MATLAB, NS2.

UNIT IV Research Ethics **(15 Hours)**

Philosophy - Definition, nature, scope and concept - Ethics – definition, moral philosophy, nature of moral judgments and reactions - Ethics with respect to science and research- Scientific misconducts– falsification, fabrication and plagiarism software – Turnitin, Urkund and other open source software tools - Redundant publications-duplicate and overlapping publications - Publication ethics- definition and importance. Publication miscount-definition, concept, problems that lead to unethical behavior, types, Violation of publication ethics, authorship and contributor ship - Software tool to identify predatory publications developed by SPPU - Subject specific ethical issues-authorship, Conflicts of interest.

UNIT V Ethics in Information Technology **(15 Hours)**

Overview of Ethics: Definition of Ethics - The Importance of Integrity - The Difference Between Morals, Ethics, and Laws - Ethics in the Business World - Corporate Social - Improving Corporate Ethics Creating an Ethical Work Environment - Ethics in InformationTechnology – **Ethics for IT Workers and IT users**: IT Professionals - Professional Relationships - Professional Codes of Ethics - Professional Organizations.

Total Lecture Hours - 75

COURSE OUTCOMES

The students will be able to,

1. Understand the basic concepts of research and its types
2. Analyze the research problems in the real world scenario
3. Understand scholarly writing and development of the skills to write the same
4. Use tools related to research in Computer Science
5. Describe the art of thesis writing

TEXT BOOK(S)

1. Garg B.L.Karadia, R.Agarwal, F and Agarwal, "An Introduction to Research Methodology" RBSA Publishers, U.K., 2002
2. George Reynolds, "Ehics in Information Technology" Thompson Course Technology, 2007 ISBN 13:978-1-4188-3631-3(Chapter:1,2,10)
3. Kothari C.R. Research Methodology – methods and techniques, 2 nd Edition,Wishwa Prakashjan NewDelhi 1999
4. Sinha.S.C, and Dhiman A.K, 2002, " Research Methodology", Ess Ess Publications- Second Volume
5. Trochim W.M.K, "Research Methods: the concise knowledgebase", 2005, Atomic Dog Publishing.

REFERENCE BOOK(S)

1. Anderson, Durston and Poole, 'Thesis and Assignment writing', Wiley Eastern Ltd.ND1970
2. Misra R.P. Research Methodology–A Hand Book, Concept publishing Company, NewDelhi1988

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1. https://ccsuniversity.ac.in/bridge-library/pdf/Research-Methodology-CR-Kothari.pdf
2. https://repository.dinus.ac.id/docs/ajar/ethics_in_information_technology2c_5th_ed._0 3. _.pdf

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2	2
CO2	3	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3
CO3	3	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2	2
CO4	3	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2	2
CO5	3	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3

S-Strong (3) M-Medium (2) L-Low (1)

Semester: III–EC-V(b) - INTELLIGENT SYSTEMS

Ins. Hrs. /Week: 5 **Course Credit: 3** **Course Code:P23ITE35B**

UNIT I **(15 Hours)**

Artificial Intelligence: AI problems-AI technique-**Problem Search:**-Production Systems – Problem Characteristics – Production system characteristics- **Heuristic Search techniques**: Generate and Test – Hill Climbing – Constraint Satisfaction, Means-end analysis.

UNIT II **(15 Hours)**

Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations –-Frame problem –. **Using Predicate Logic**: Representing simple facts in logic - Representing Instance and ISA relationships – Computable functions and predicates – Resolution.

UNIT III **(15 Hours)**

Representing knowledge using rules: Procedural Vs Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge. **Knowledge representation summary**: Syntactic and Semantic spectrum of representation-Logic and slot – and-filler structures-Other representational techniques.

UNIT IV **(15 Hours)**

Rule-based expert systems: Introduction- Rules as a knowledge representation technique- players-Structure- Forward chaining and backward chaining inference techniques- **Fuzzy expert systems**: Introduction- Fuzzy sets- Linguistic variables and hedges- Operations - Fuzzy rules- - Building a fuzzy expert system.

UNIT V **(15 Hours)**

Artificial neural networks: Neuron- perceptron- Multilayer neural networks- - The Hopfield network- **Robotics**: Introduction-Robot hardware-Perception-Moving-Robotic software architecture.

Total Lecture Hours: 75

COURSE OUTCOMES

The students will be able to,

1. Enhance the Knowledge.
2. Understand the Problem Solving,
3. Implement Analytical ability and Professional Competency.
4. Evaluate Professional Communication .
5. Create and implement Transferrable Skill.

TEXT BOOK(S)

1. Elaine rich and Kelvin Knight, "**Artificial Intelligenc**e ", Tata McGraw hill Publication, 3ndEdition, 2009. [Unit - I,II,III]

Unit I : Chapters 1, 2, 3

Unit II : Chapters 4, 5

Unit III : Chapters 6, 11

2. Michael Negnevitsky, Addison Wesley, **Artificial Intelligence: A Guide to Intelligent System**s, 3rd edition, 2011.[Unit IV-Chapter 1,2,4,V-Chapter 6]
3. Stuart Russell & Peter Norvig, **Artificial Intelligence a modern Approach** "3rd Edition Pearson Education[Unit V-Chapter 25-Robotics]

REFERENCE BOOK(S)

1. George F Luger , "**Artificial Intelligence** ",4thEdition , Pearsons Education Publ, 2002.
2. Stuart Russell & Peter Norvig, "**Artificial Intelligence a modern Approach** "–3rd Edition, Pearson Education.
3. V S Janaki Raman, K Sarukesi, P Gopalakrishnan, "**Foundations of Artificial Intelligent And Expert Systems**", Macmillan India Limited

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1. https://www.techopedia.com/definition/190/artificial-intelligence-ai
2. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligent_systems.htm
3. https://data-flair.training/blogs/heuristic-search-ai/
4. http://teaching.csse.uwa.edu.au/units/CITS7212/Lectures/Students/Fuzzy.pdf
5. http://engineering.nyu.edu/mechatronics/smart/pdf/Intro2Robotics.pdf

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
CO2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
CO3	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
CO4	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
CO5	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3

S-Strong (3) M-Medium (2) L-Low (1)

SEMESTER: III–EC-V(c) - VIRTUAL AND AUGMENTED REALITY

Ins.Hrs./Week:5 **Course Credit:3** **Course Code:P23ITE35C**

UNIT I **(16 Hours)**

INTRODUCTION The three I's of virtual reality-commercial VR technology and the five classic components of a VR system - Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation-interfaces and gesture interfaces-Output Devices: Graphics displays-sound displays & haptic feedback.

UNIT II **(14 Hours)**

VR DEVELOPMENT PROCESS Geometric modeling - kinematics modelling- Physical modeling - behavior modeling - model Management.

UNIT III **(16 Hours)**

CONTENT CREATION CONSIDERATIONS FOR VR Methodology and terminology-user performance studies-VR health and safety issues-Usability of virtual reality system- cyber sickness -side effects of exposures to virtual reality environment

UNIT IV **(14 Hours)**

VR ON THE WEB & VR ON THE MOBILE JS-pros and cons-building blocks (WebVR, WebGL, Three.js, device orientation events)- frameworks (A-frame, React VR)-Google VR for Android-Scripts, mobile device configuration, building to android-cameras and interaction-teleporting-spatial audio-Assessing human parameters-device development and drivers-Design Haptics

UNIT V **(15 Hours)**

APPLICATIONS Medical applications-military applications-robotics applications- Advanced Real time Tracking- other applications- games, movies, simulations, Therapy. CURRENT CONTOURS (For continuous internal assessment only): Contemporary Developments Related to the Course during the Semester Concerned.

Total Lecture Hours:75

COURSE OUTCOMES

Upon successful completion of this course the students would be able to

- Understand the basics of VR and AR
- Analyze & Design a system or process to meet given specifications with realistic engineering constraints.
- Identify problem statements and function as a member of an engineering design team.
- Utilize technical resources
- Propose technical documents and give technical oral presentations related to design mini project results.

TEXT BOOK(S)

1. C. Burdea & Philippe Coiffet, "Virtual Reality Technology", Second Edition, Gregory, John Wiley & Sons, Inc., 2008. Unit-1: Chapters 1,2,3, Unit-2: Chapter 5, Unit-3: Chapter 7, Unit-4: Chapter 7, Unit-5: Chapter 8

2. Jason Jerald. 2015. The VR Book: Human-Centred Design for Virtual Reality.Association for Computing Machinery and Morgan & Claypool, New York, NY, USA.

REFERENCE(S)

1. Dieter Schmalstieg & Tobias Hollerer, Augmented Reality: Principles and Practice (Usability), Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016. ISBN: 9780321883575

2. Robert Scoble & Shel Israel, The Fourth Transformation: How Augmented Reality & Artificial Intelligence Will Change Everything, Patrick Brewster Press;1 edition, 2016.

3. Steve Aukstakalnis, Addison-Wesley Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability), Professional; 1 edition, 2016.

4. Tony Parisi, Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile, O'Reilly Media; 1 edition, 2015.

5. Tony Parisi, Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages, O'Reilly Media; 1 edition, 2014.

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1. http://VR Development Pathway - Unity Learn
2. http://(PDF) Past, present and future of Virtual Reality: Analysis of its technological variables and definitions (researchgate.net)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	2	3	2	3	3	3	3	3	3	3	3	2	3	2	3	2	3
CO2	2	2	3	2	3	2	3	3	2	3	2	3	2	3	2	3	2
CO3	2	3	3	3	2	3	2	2	3	3	3	2	3	2	3	3	3
CO4	2	3	2	3	3	3	3	3	3	2	3	3	3	2	3	2	3
CO5	2	2	3	2	3	2	3	3	2	3	2	3	2	3	2	3	2

S-Strong (3) M-Medium (2) L-Low (1)

SEMESTER: III - SEC - ANIMATION IN FLASH

Ins. Hrs. /Week: 2 **Course Credit:2** **Course Code: P23SEIT31**

UNIT I Introduction **(6 Hours)**

Introduction : Computer Animation - Macromedia flash - History of Macromedia flash - Bitmap Graphics - Vector Graphics.

UNIT II Creating, Modifying, Saving And Opening Flash Document **(6 Hours)**

Function of the start page - Parts of the macromedia flash screen - different elements of the macro media flash - creating flash document - modifying document properties - saving the flash document - Opening an Existing flash document.

UNIT III Drawing And Painting Objects **(6 Hours)**

Drawing and Painting Objects : Drawing lines - using the Line , Pencil and Pen Tool - Creating shapes - Using Rectangle , oval , polystar , brush - color modes , color tool , Color mixer panel and working with gradient.

UNIT IV Using Tools **(6 Hours)**

Ink bottle tool , eye dropper tool , drawing modes - using the selection tools , transforming objects - Eraser tools - Align panel - changing the stacking order.

UNIT V Using Text And Objects **(6 Hours)**

Using Text - types of text - adding text - formatting text - converting text into shapes - Moving objects , copying objects and Grouping objects.

Total Lecture Hours : 30

COURSE OUTCOMES

Upon successful completion of this course, students will be able to

1. Apply animation and drawing through different tools
2. Enhance the features of frame and object properties
3. Implement the properties such as position, size and rotation for an instance
4. Enhance the creativity and designing Techniques
5. Create animation using scripting

TEXT BOOK (S)

1. Russell Chun, "Adobe Flash Professional CC" , Adobe press , Pearson Education 2014

REFERENCE BOOK (S)

1. Aaron pedersen , James polanco, Doug Winnie, "Adobe Flash platform from start to finish", Adobe press, 2010

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1. https://ptgmedia.pearsoncmg.com/images/9780133927108/samplepages/9780133927108.pdf
2. https://ptgmedia.pearsoncmg.com/images/9780321680716/samplepages/0321680715. pdf

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	2	3	2	3	3	3	2	3	3	2	3	2	3	2	3	3	2
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	2	3	2	3	3	3	2	3	3	2	3	2	3	2	3	3	2
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	2	3	2	3	3	3	2	3	3	2	3	2	3	2	3	3	2

S-Strong (3) M-Medium (2) L-Low (1)

Semester: III -VAC- II – FUNDAMENTALS OF INFORMATION SECURITY

Ins. Hrs. /Week: **Course Credit:2** **Course Code:P23ITVA32**

UNIT I Introduction

Overview of Computer security, Security concepts, Need of Security- Threats- Deliberate Software Attacks, Deviation in Quality of Service, Attacks- Malicious Code, Brute Force, Timing Attack, Sniffers. **Access Control Mechanisms** - Access Control, Access Control Matrix, Access Control in OS- Discretionary and Mandatory Access Control, Role-based Access Control.

UNIT II Security Policies and Models

Confidentiality Policies, Bell- LaPadula Model, Integrity Policies, Biba Model, Clark-Wilson Models, Chinese wall Model, Waterfall Model.

UNIT III Malware

Viruses, Worms and Trojans. Topological Worms. Internet Propagation Models for Worms.

UNIT IV Security in Current Domains

Wireless LAN Security - WEP details. Wireless LAN Vulnerabilities – Frame Spoofing. Cellphone Security - GSM and UMTS Security. Mobile Malware - Bluetooth Security Issues.

UNIT V Secure Electronics Transactions

Framework, Strength and Weakness, Security in Current Applications : Online Banking , Credit Card Payment Systems. **Web Services Security**: XML, SOAP, SAML, RFID

COURSE OUTCOMES

The Student will be able to

1. Appreciate the common threats faced today
2. Interpret the foundational theory behind information security
3. Identify the potential vulnerabilities in software
4. Appreciate the relevance of security in various domains
5. Develop secure web services and perform secure e-transactions

TEXT BOOK(S)

1. Bernard Menezes, Network Security and Cryptography, Cengage Learning India, 2010.
2. M Bishop, Computer Security: Art and Science, Pearson Education, 2003.

REFERENCE BOOK(S)

1. Behrousz A Forouzan, D Mukhopadhyay, Cryptography and network Security,McGraw Hil
2. C P. Fleeger and S L Fleeger, Security in Computing, 3/e, Pearson Education, 2003.
3. E Whiteman and J Mattord, Principles of information security 4th edn, CengageLearning
4. V K Pachghare, Cryptography and information security, PHI
5. W Mao, Modern Cryptography: Theory & Practice, Pearson Education, 2004.

E_RESOURCES

1. http://ndl.ethernet.edu.et
2. http://www.mim.ac.mw
3. https://research.lemoyne.edu

SEMESTER IV

SEMESTER: IV – CC -VII Dot Net

Ins. Hrs. /Week: 5 **Course Credit:5** **Course Code:P23IT410**

UNIT I Introducing C# **(14 Hours)**

Dot NET Framework - C# language - Visual Studio 2017 - Writing a C# Program: Visual Studio 2017 Development Environment - Console Applications - Desktop Applications - Variables and Expressions: Basic C# Syntax - Basic C# Console Application Structure - Variables - Expressions - Flow Control: Boolean Logic – Branching - Looping.

UNIT II Variables, Functions And Object Oriented Programming **(15 Hours)**

More About Variables: Type Conversion - Complex Variable Types - String Manipulation – Functions: Defining and Using Functions - Variable Scope - The Main Function - Struct Functions - Overloading Functions - Using Delegates - Debugging and Error Handling: Debugging in Visual Studio - Error Handling - Introduction to Object Oriented Programming: Object-Oriented Programming - OOP Techniques - OOP in Desktop Applications.

UNIT III Classes And Cloud Programming **(16 Hours)**

Defining Classes: Class Definitions in C# - System Object - Constructors and Destructors - OOP Tools in Visual Studio - Class Library Projects - Interfaces Versus Abstract Classes - Struct Types - Shallow Copying Versus Deep Copying - Defining Class Members: Member Definitions - Additional Class Member Topics - Interface Implementation - Partial Class Definitions - Partial Method Definitions - The Call Hierarchy Window - Basic Cloud Programming: Cloud, Cloud Computing, and the Cloud Optimized Stack - Cloud Patterns and Best Practices - Using Microsoft Azure C# Libraries to Create a Storage Container - Creating an ASP.NET 4.7 Web Site That Uses the Storage Container - Advanced Cloud Programming and Deployment: Creating an ASP.NET Web API - Deploying and Consuming an ASP.NET Web API on Microsoft Azure - Scaling an ASP.NET Web API on Microsoft Azure.

UNIT IV .Net Standard And .Net Core **(15 Hours)**

Cross-Platform Basics and Must Know Terms – Need of .NET - Referencing and Targeting Frameworks - .NET Core - Building and Packaging a.NET Standard Library - Building a .NET Core Application with Visual Studio - Porting from .NET Framework to .NET Core - ASP.NET and ASP.NET Core: Overview of Web Applications – Use of ASP.NET - ASP.NET Web Forms - Creating ASP.NET Core Web Applications – Files: File Classes for Input and Output – Streams - Monitoring the File System - XML and JSON: XML Basics - JSON Basics - XML Schemas - XML Document Object Model - Converting XML to JSON - Searching XML with XPath.

UNIT V Linq And Database **(15 Hours)**

LINQ: LINQ TO XML - LINQ Providers - LINQ Query Syntax - LINQ Method Syntax - Ordering Query Results - Understanding the orderby Clause - Querying a Large Data Set -Using Aggregate Operators - Using the Select Distinct Query - Ordering by Multiple Levels -Using Group Queries - Using Joins – Databases: Using Databases - Installing SQL Server - Express - Entity Framework - Code First Database - Finding the Database - Navigating Database Relationships - Handling Migrations - Creating and Querying XML from an Existing Database - Universal Apps: Windows Universal Apps - App Concepts and Design - App Development - Common Elements of Windows Store Apps - Windows Store.

Total Lecture Hours-75

COURSE OUTCOMES

Upon successful completion of this course, students will be able to

1. Understand and learn .NET Framework and C# .NET
2. Apply the concepts to develop the applications for real-time problem in C# .NET and ASP .NET
3. Analyze the feasibility of using .NET for real time problems
4. Develop real-time standalone, web applications using .NET Technologies.
5. Understand and get experience in Microsoft Azure.

TEXT BOOK(S)

1. Benjamin Perkins, Jacob Vibe Hammer, Jon D. Reid, "Beginning C#7 Programming with Visual Studio 2017", Wiley Publishing, 2018. Chapters: 1 to 10, 16 to 23, and 25.

REFERENCE BOOK(S)

1. Mehboob Ahmed Khan, Ovais, "C# 7 and .NET Core 2.0 High Performance", Packt Publishing, 2018.
2. Nagel, Christian, "Professional C 7 and .NET Core 2.0", Wrox Publishing, 2018.

E- RESOURCES

1. https://shorturl.at/ehNOU
2. https://shorturl.at/bkqt5

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	2	3	2	3	3	3	3	2	3	2	3	2	2	3
CO2	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO3	3	2	3	2	3	3	3	2	2	3	2	3	2	3	2	2	3
CO4	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO5	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2	2	3

2. **S-Strong (3) M-Medium (2) L-Low (1)**

SEMESTER: IV – CC -VIII - ARTIFICIAL INTELLIGENCE

Ins. Hrs. /Week: 5 **Course Credit:5** **Course Code:P23IT411**

UNIT I Introduction to Artificial Intelligence (18 Hours)

Various Definitions of AI-Foundation of AI-Strong and Weak AI-History of AI-**Current Trends in AI:** Game Playing-Logistic Planning-Robotics-Language understanding and Problem Solving-Human Vs Machine-Feature of Artificial Intelligence-**Intelligent Agents:** Agents and its Environment –Architecture of Agent- Role of an Agent Program-The weak and Strong Agent-The Environments- Types of Agents-Designing an Agent System.

UNIT II Problem solving Methods (18 Hours)

Problem Solving Strategies: Searching for Solution-Search Strategies- Control Strategy-Repeated States-Searching with partial Information-**Heuristic Search Strategies:** Heuristic Search-Local Search Algorithms and Optimization Problems - **Constraint Satisfaction Problems:** Constraint Satisfaction Problem Concepts- Constraints in CSPs-Backtracking Search-Local Search for CSP-Graph Structured CSP-**Adversarial Search and Games in AI:** Game Playing – Formal Representation of a Game as a Problem-Major Components of Game Playing Program-Min-Max Algorithm-**Alpha-Beta Pruning:** Steps in Alpha-Beta Pruning-Alpha Cutoff-Beta Cutoff-Algorithm for Alpha-Beta Pruning-Examples of Alpha-Beta Pruning.

UNIT III Knowledge Representation (18 Hours)

Knowledge Representation and Prepositional Logic: Representation and Mappings-Approaches to Knowledge Representation-Prepositional Logic-Semantics for Prepositional Logic-Forward and Backward Chaining-Agent based on Prepositional Logic – **First Order Predicate Logic:** First Order Logic-Quantifiers-Wumpus World represented using First Order Logic-Monotonic and Non-Monotonic Reasoning-Programming in AI using Prolog-Knowledge Representation and Ontological Engineering.

UNIT IV Introduction to Software Agent (11 Hours)

Software Agent and Multi Agent Systems: Intelligent Agent-Intelligent Programming Languages-**Multiagent Systems and Agent's Communication:** Need for Multi-agent Systems-Characteristics of Multi-agent Systems-Working Together in Multi-agent System-Artificial Neural Networks.

UNIT V Applications (10 Hours)

AI in Field of Natural Language Processing: Introduction to Natural Language Processing-Knowledge Level used in Natural Language Processing-NLP Techniques-Morphological Analysis-Advantages of NLP-Problems in NLP-NLP Systems and Research in NLP-Information Retrieval(IR)-Big Data and Information Retrieval-Speech Recognition**. Robotics:** Overview of Robotics-Robot Classification-Robot Characteristics-Use of Robots-Mapping for a Point Robot-Contact-Inertial-Infrared Sensors-Sonar-Radar-Laser Rangefinders-Biological Sensing-Horizontal Decomposition-Middleware-Robotic Assistant for persons with Disability-Robotic as Therapist for Neurological Conditions-Exoskeleton Robots for Replacing Motor Functions.

Total Lecture Hours-75

COURSE OUTCOMES

The Students will be able to,

1. Understand the problems that are amenable to solution by AI methods.
2. Understand the appropriate AI methods to solve a given problem.
3. Learn about the Formalise given problem in the language/framework of different AI methods.
4. Implement basic AI algorithm
5. Understand the basic concepts of robotics.

TEXT BOOK(S)

1. Anamitra Deshmukh-Nimbalkar, " Artificial Intelligence", Technical Publications, FirstEdition, Jan 2020, Chennai, Tamil Nadu. 2020.
2. David L.Poole, Alan K.Mackworth, "Artificial Intelligence: Foundations of Computational Agents" , Cambridge University Press, Cambridge, England, 2010.
3. Elaine Rich and Kevin Knight," Artificial Intelligence", Second Edition, Tata McGraw Hill Publishers Company Pvt Ltd, New Delhi, India. 1991.

REFERENCE BOOK(S)

1. Ethem Alpaydin,"Introduction to Machine Learning"(Adaptive computation and Machine Learning Series),Second Edition, The MIT Press, Cambridge. 2009.
2. Stuart Russel and Peter Norvig, "AI – A Modern Approach", 2nd Edition, PearsonEducation, London, England. 2007.

E-RESOURCES

1. https://bit.ly/3ehDIG4
2. https://bit.ly/3suPDWf
3. https://bit.ly/2Q6dlLv

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3	3	3
CO2	2	3	2	3	2	3	2	2	3	2	3	2	3	2	3	3	2
CO3	3	2	3	2	3	3	3	3	2	3	2	3	3	3	2	2	3
CO4	2	3	2	3	2	3	2	2	3	2	3	2	3	2	3	3	2
CO5	3	2	3	2	3	2	3	3	2	3	2	3	2	3	2	2	3

S-Strong (3) M-Medium (2) L-Low (1)

SEMESTER: IV – CP -IV - Dot Net LAB

Ins. Hrs. /Week: 6 **Course Credit:3** **Course Code:P23IT412P**

EXERCISES

1. C# Basics
2. Delegates
3. Lambda Expressions
4. LINQ
5. Usage of Web Sever Controls
6. Usage of AdRotator, Calendar Controls
7. Working with Validation controls
8. Menu Control
9. Cookies, View state, Session
10. Developing Database Applications using Data Grid
11. Creating Crystal Report

Total Lecture Hours-90

COURSE OUTCOMES

On successful completion of this course, the students will be able to:

1. Demonstrate simple programs using C# programming concepts such as classes, objects, method overloading,
2. Solve complex programs using delegates, Lambda expression and LINQ
3. Analyze the usage of web server controls, calendar controls, validation controls
4. Select the appropriate web controls to develop the web forms.
5. Construct a database driven web applications with the facilitated web services.

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	2	3	2	3	3	3	3	2	3	2	3	2	2	3
CO2	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO3	3	2	3	2	3	3	3	2	2	3	2	3	2	3	2	2	3
CO4	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO5	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2	2	3

S-Strong (3) **M-Medium (2)** **L-Low (1)**

Semester: IV-EC-VI(a) - INTERNET OF THINGS

Ins.Hrs./Week:4 **Course Credit: 3** **Course Code: P23ITE46A**

UNIT I Fundamentals Of IOT **(13 Hours)**

Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack -– Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II IOT Protocols **(12 Hours)**

IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.

UNIT III Prototyping Embedded Devices **(13 Hours)**

Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp.Prototyping the Physical Design: Non digital Methods - Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.

UNIT IV Prototyping Online Components **(12 Hours)**

Getting started with an API - Writing a New API - Real-Time Reactions - Other Protocols. Techniques for Writing Embedded Code: Memory Management - Performance and Battery Life – Libraries - Debugging.

UNIT V Business Models With Field Project **(10 Hours)**

History of Business Models – Model – Internet of Starting up – Lean Startups. Moving to Manufacture: Designing Kits - Designing Printed circuit boards – Certification – Costs - Scaling Up Software. Ethics: Privacy – Control – Environment – Solutions.

Total Lecturer Hours:60

COURSE OUTCOMES

On the successful completion of the course, students will be able to

1. Comprehend the IoT evolution with its architecture and sensors
2. Understand the networking concepts for communication and underlying IoT protocols
3. Assess the embedded technologies and develop prototypes for the IoT products
4. Evaluate the use of Application Programming Interface and design an API for IoT in real time
5. Recognize the ethics of business models and perform security analysis.

TEXT BOOK(S)

1. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017.

REFERENCE BOOK(S)

1. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black",McGraw Hill, 2015.
2. Ovidiu Vermesan and Peter Friess, "Internet of Things – From Research and Innovation to MarketDeployement" , River Publishers, 2014.
3. Peter Waher, "Learning Internet of Things" ,Packt Publishing, 2015.

E-RESOURCES

1. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/
2. https://data-flair.training/blogs/iot-applications/
3. https://www.sciencedirect.com/topics/computer-science/wireless-sensor-networks

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	2	3	2	3	2	3	3	3	3	2	3	2	3	2
CO2	2	3	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3
CO3	3	2	3	2	3	2	3	3	3	2	2	3	2	3	2	3	2
CO4	2	3	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3
CO5	3	2	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2

S-Strong (3) M-Medium (2) L-Low (1)

Semester: IV-EC-VI (b)- TRENDS IN COMPUTING

Ins. Hrs. /Week: 4 **Course Credit: 3** **Course Code:P23ITE46B**

UNIT I Cloud Computing **(12 Hours)**

Basics: Overview – Applications – Intranets and the Cloud – First Movers in the Cloud – Organization and Cloud Computing: Benefits – Limitations – Security Concerns- The Business Case for Going to the Cloud: Cloud Computing Services -Deleting Datacentre.

UNIT II Hardware And Infrastructure **(12 Hours)**

Clients – Security – Network –Services- Accessing the Cloud: Platforms - Cloud Storage: Overview – Cloud Storage Providers

UNIT III Developing Applications **(12 Hours)**

Google – Microsoft - Local Cloud and Thin Clients: Virtualization – Server Solutions – Thin Clients – Migrating to the Cloud

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UNIT IV Grid Computing **(12 Hours)**

Introduction - Benefits – Grid Terms and Concepts: Types of Resources – Jobs and Applications –Scheduling, Reservation and Scavenging – Grid Software Components – Grid user role: User Perspective – Administrator Perspective - Design: Building grid architecture - Models – Topologies – Phases and Activities.

UNIT V Green Computing **(12 Hours)**

Introduction - History of Green Computing - Regulations and Industry Initiative - The Demons behind Green Computing - Approaches to Green Computing - Role of IT vendors - Green Computing Tips - Future is Green.

Total Lecture Hours-60

COURSE OUTCOMES

The Student will be able to

1. Outline the history, applications, benefits and limitations of Cloud, Grid and Green computing
2. Describe the cloud infrastructure services, virtualization and determine how applications can be developed using cloud services
3. Identify cloud storage providers, software components of grid, technologies applied in building a green system and various key sustainability in Green IT Trends
4. Analyse the migrations and security concerns of cloud, different grid models, resources and also identify how the distributed computing environments can be built from lower level services
5. Assess the business cases of cloud, and also various laws, approaches and protocols for regulating green IT

TEXT BOOK(S)

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, "Cloud Computing - A practical Approach" , McGraw Hill, 2010.
2. Bart Jacob, Michael Brown, Kentaro Fukui, and NiharTrivedi, "Introduction to Grid Computing" ,IBM Redbook, 2005

REFERENCE(S)

1. Bud E. Smith ," Green Computing: Tools and Techniques for Saving Energy, Money, and Resources", Auerbach Publications , 2013.
2. George Reese, "Cloud Application Architectures: Building Applications and Infrastructures in the cloud", O"Reilly Media Inc., 2009.
3. Halper Fern, Kaufman Marcia, Bloor Robin, Hurwit Judith, "Cloud Computing for Dummies ", Wiley India Pvt Ltd ,2009.
4. J. Velete, Anthony T. Velete, Robert Elsenpeter, "Green IT – Reduce Your Information System"s Environmental Impact While Adding to the Bottom Line", McGraw-Hill ,2008.

E-RESOURCES

1. http://www.siteground.com/tutorials/cloud/cloud_computing_infrastructure.htm
2. http://thecloudtutorial.com/
3. http://studymafia.org/wp-content/uploads/2015/11/CSE-Green-Computing-Report.pdf
4. http://www.znu.ac.ir/data/members/dastjerdi_mohammad/Book11.pdf (Unit IV)
5. http://www.cs.kent.edu/~farrell/grid06/lectures/grid01.pdf (Unit V)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	2	2	3	3	3	3	3	3	3	3	3	3	2
CO2	3	2	2	3	3	3	2	2	2	3	2	3	3	2	2	3	3
CO3	2	3	3	3	3	2	3	2	2	2	2	3	2	3	3	3	3
CO4	3	2	3	2	3	3	2	2	2	3	3	3	3	2	3	2	3
CO5	2	3	3	3	2	2	3	3	3	2	3	2	2	3	3	3	2

S-Strong (3) M-Medium (2) L-Low (1)

Semester: IV-EC-VI(c)- INTRODUCTION TO ROBOTICS

Ins. Hrs. /Week: 4 **Course Credit: 3** **Course Code:P23ITE46C**

UNIT I Introduction **(12 Hours)**

Introduction-Definition of Automation-Mechanization Vs Automation-Advantages-Goals-Social Issues-Types-Current Emphasis in Automation-Issues in automation in Factory Operations-Strategies of Automation

UNIT II Introduction Robotics **(12 Hours)**

History of Robots- Definition- Laws of Robotics-Characteristics-Components-Comparison of the Human and the Robot Manipulator-Robot Wrist and End of Arm Tools-Robot Terminology-Robotic Joints-Classification-Selection-Workcell-Robotics and Machine Vision-Applications

UNIT III Robot Components: **Sensors** **(12 Hours)**

Robot Components: **Sensors**: Exteroceptors Sensors -Tactile Sensors -Proximity Sensors-Range Sensors-Machine Vision Sensors-Velocity Sensors-Proprioceptors-Robots with sensors- **End Effectors**: Grippers-selection of grippers-Gripping mechanism- tools-Types of Grippers- **Drives**: Pneumatic, Hydraulic, Electric Actuators

UNIT IV Transformations **(12 Hours)**

Transformations: Introduction to Manipulator Kinematics -Homogeneous Transformations-Robot Kinematics-Manipulator Path Control-Robot Dynamics- **Robot Programming Techniques**: Online programming- Lead-through Programming-Offline Programming-Task Level Programming-Motion Programming-Robot Programming Languages-Robot languages and its types

UNIT V Applications Of Robots **(12 Hours)**

Applications of Robots: Robot Capabilities-Application of Robots-Manufacturing Applications-Material handling applications **Robotics and Artificial Intelligence:** Vision-Voice communication-Planning-Modelling-Adaptive control-Error monitoring and recovery-Autonomy and intelligence in robots-Expert systems in robotics **Total Lecture Hours : 60**

COURSE OUTCOMES

The Student will be able to

1. Outline the anatomy, specifications and applicability of Robotic system
2. Demonstrate the role of kinematics and dynamic behavior of robots with programming techniques
3. Identify the characteristics and functionality of robots in various sectors.
4. Analyze the various functionality of robotic systems with respect to software and hardware components
5. Assess the scientific background of robotic systems through various real time examples

TEXT BOOK(S)

1. D.J.Todd, "Fundamentals of Robot Technology", An Introduction to Industrial Robots, Teleoperators and Robot Vehicles, Wiley,1986.(Unit V: Robotics and Artificial Intelligence)
2. Gupta.A.K, Arora. S. K., Industrial Automation and Robotics, Mercury Learning and Information, 2017(Unit I,II ,III,IV,V)
3. Mikell P Groover, "Industrial Robotics", Mc GrawHill, 2012.(Unit III: Drives :Fundamentals of Robot technology -Robot Drive systems, Unit IV: Transformations)

REFERENCE(S)

1. Ghoyal.K., Deepak Bhandari, "Automation and Robotics", S.K.Kataria& Sons Publishers, 2012.
2. Gonzalez, Fu Lee, Robotics: Control, Sensing, Vision and Intelligence, Wiley, 1998
3. John.J. Craig, "Introduction to Robotics: Mechanics and Control", Pearson, 2018.
4. Thomas. K. Rufuss, "Robotics and Automation Handbook", CRC Press, 2018

E-RESOURCES

1. https://builtin.com/robotics
2. https://www.elprocus.com/robot-sensor/
3. https://sp-automation.co.uk/the-top-seven-types-of-robots/
4. https://robots.ieee.org/learn/types-of-robots/
5. https://www.intel.in/content/www/in/en/robotics/types-and-applications

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
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CO2	3	2	2	3	2	2	3	3	3	2	2	2	2	3	3	3	2
CO3	2	3	3	2	3	3	3	3	2	3	2	3	3	3	3	2	3
CO4	3	2	3	3	2	3	2	3	3	2	2	2	3	2	3	3	2
CO5	2	3	3	2	3	3	3	2	2	3	3	3	3	3	2	2	3

S-Strong (3) M-Medium (2) L-Low (1)

Semester: IV– Professional Competency Course - COMPUTER SCIENCE FOR NET/SET

Ins. Hrs. /Week: 2 **Course Credit:2** **Course Code:P23PCIT41**

UNIT - I : Discrete Structures and Optimization and Computer System Architecture (6 Hours)
Discrete Structures and Optimization: Mathematical Logic -Sets and Relations - Counting, Mathematical Induction and Discrete Probability - Group Theory - Graph Theory - Boolean Algebra – Optimization - **Computer System Architecture :** Digital Logic Circuits and Components - Data Representation - Register Transfer and Microoperations - Basic Computer Organization and Design - Programming the Basic Computer - Microprogrammed Control - Central Processing Unit - Pipeline and Vector Processing - Input-Output Organization - Memory Hierarchy – Multiprocessors.

UNIT - II Programming Languages,Computer Graphic, Database Management Systems (6 Hours)
Programming Languages: Language Design and Translation Issues - Elementary Data Types - Programming in C - Object Oriented Programming - Programming in C++ - Web Programming - **Computer Graphics:** 2-D Geometrical Transforms and Viewing - 3-D Object Representation, Geometric Transformations and Viewing - **Database Management Systems:** Database System Concepts and Architecture - Data Modeling – SQL - Normalization for Relational Databases - Enhanced Data Models - Data Warehousing and Data Mining - Big Data Systems.

UNIT III System Software and Operating System and Software Engineering (6 Hours)
System Software and Operating Systems: System Software - Basics of Operating System - Process Management – Threads - CPU Scheduling – Deadlocks - Memory Management - Storage Management - File and Input/Output Systems – Security - Virtual Machines – Linux operating Systems - Windows Operating Systems - Distributed Systems. **Software Engineering:** Software Process Models - Software Requirements **-** Software Design - Software Quality - Estimation and Scheduling of Software Projects - Software Testing - Software Configuration Management.

UNIT IV Data Structures and Algorithms and Theory of Computation and Compilers (6 Hours)
Data Structures and Algorithms: Data Structures - Performance Analysis of Algorithms and Recurrences - Design Techniques - Lower Bound theory - Graph Algorithms - Complexity Theory - Advanced Algorithms. **Theory of Computation – Compilers:** Regular Language Models - Context Free Language - Turing Machines(TM) **-** Unsolvable Problems and Computational Complexity - Syntax Analysis - Semantic Analysis - Run Time System - Intermediate Code Generation - Code Generation and Code Optimization.

UNIT V Data Communication and Computer Networks and Artificial Intelligence (6 Hours)

Data Communication and Computer Networks: Network Models - Functions of OSI and TCP/IP Layers - World Wide Web (WWW) - Network Security - Mobile Technology - Cloud Computing and IoT - **Artificial Intelligence (AI):** Approaches to AI - Knowledge Representation – Planning - Natural Language Processing - Multi Agent Systems - Fuzzy Sets - Genetic Algorithms (GA) - Artificial Neural Networks (ANN).

Total Lecture Hours -30

COURSE OUTCOMES

Upon successful completion of this course, students will be able to

1. Demonstrate the concepts of Discrete Structures and Optimization and Computer System Architecture
2. Analyze the applications of Programming Languages, Computer Graphics and Database Management Systems
3. Analyze the concepts of System Software, Operating System and Software Engineering
4. Understand the features of Data Structures and Algorithm, Theory of Computation and Compilers
5. Understand the Data Communication and Computer Networks and Artificial Intelligence (AI)

TEXT BOOK(S)

1. R.Gupta, "NTA-UGC-NET/JRF: Computer Sciences & Applications (Paper I & Paper II) Previous Years Papers (Solved)", 2024, RPH Editorial Board

REFERENCE BOOK(S)

1. Behrouz A.Forouzan, "Data Communications and Networking", 5th Edition, McGraw Hill Education.
2. Donald D.Hearn, M.Pauline Baker, "Computer Graphics C Version", 2nd Edition, Pearson Education India.
3. Douglas B.West, "Introduction to Graph Theory", 2nd Edition, Pearson Education India.
4. Dhananjay Dhamdhere, "System Programming", 1st Edition, McGraw Hill Education.
5. Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, "Fundamentals of Data Structures in C", 2nd Edition, Universities Press.
6. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, "Introduction to Automata Theory, Languages, and Computation", 3rd Edition, Pearson Education.
7. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, McGraw Hill Education (India) Private Limited.
8. M. Ganesh, "Introduction to Fuzzy Sets and Fuzzy Logic", Prentice Hall India Learning Private Limited.
9. Morris Mano,"Computer System Architecture", Third edition,2019
10. Peter Norvig, Stuart J.russell, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education India
11. Pressman, "Software Engineering: A Practitioner's Approach", 8th Edition, McGraw Hill Education.
12. Stuart E.Madnick, John J.Donovan, "Operating Systems", McGraw-Hill,1978

E-RESOURCES

1. https://www.mbit.edu.in/wp-content/uploads/2020/05/computer-systems-Architecture.pdf
2. https://www.maths.ed.ac.uk/~v1ranick/papers/wilsongraph.pdf
3. https://www.ddegjust.ac.in/2021/bca/Operating%20System.pdf

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2	2	3
CO2	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO3	2	3	2	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO4	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2	2	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)