UNIVERSITY OF JAMMU,
JAMMU COURSE SCHEME
B.E 5th Semester Computer Engineering
For Examination to be held in the Year December 2020,2021,2022,2023

Contact Hrs: 24

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATION			MARKS DISTRIBUTION		TOTAL	Credits	% Change
			L	T	P	Internal	External			
PCS-501	Professional Core Course	Analysis & Design of Algorithms	3	1	0	50	100	150	4	100%
PCS-502	Professional Core Course	Computer Networks	3	1	0	50	100	150	4	100%
PCS-503	Professional Core Course	Microprocessor & Interfacing	3	1	0	50	100	150	4	100%
PCS-504	Professional Core Course	Theory of Computation	2	1	0	50	100	150	3	100%
*MOC-502	Massive Open Online course	SWAYAM /NPTEL	3	0	0	100	-	100	3	100%
PCS-512	Professional Core Course	Computer Networks Lab	0	0	3	75	-	75	1.5	100%
PCS-513	Professional Core Course	Microprocessor Lab	0	0	3	75	-	75	1.5	100%
PIT-502	Summer Industry Internship	Industrial Training	-	-	-	50	-	50	1	100%
TOTAL			**14**	**4**	**6**	**500**	**400**	**900**	**22**	

** **NOTE:-**The department shall offer the Swayam / NPTEL course out of the list of courses offered by Swayam around the time of commencement of the semester. However, the selected NPTEL course should not be similar to the regular courses offered as a part of the department curriculum.*

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER **CREDITS: 4**
BRANCH: COMPUTER ENGINEERING
COURSE NO: PCS-501
COURSE TITLE: ANALYSIS & DESIGN OF ALGORITHMS
DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
3	**1**	**0**	**100**	**50**

COURSE OUTCOMES **At the end of the course the student will be able to: -**	
CO1	Gain knowledge about the techniques for effective problem solving in computing.
CO2	Implement various design and analysis techniques such as greedy algorithms, dynamic Programming, backtracking, branch and bound techniques for real time problems.
CO3	Evaluate the concepts of P, NP and NP-Complete problems and synthesize algorithm in common engineering designing situations.

Detailed Syllabus

Section- A

Introduction to Algorithms: Analysing the Performance of an Algorithm, Space/Time complexity, Asymptotic Notation, Recurrence Relations, Performance measurement, write Algorithms in SPARK's**.** **(04 hours)**

Heap & Hash Tables: - Representing a Heap, Operations on Heaps, Applications, building a Heap, Hash Table, Hashing Functions, Resolving Collision by separate Chaining, Open Addressing, Quadratic Probing, Double Hashing, Rehashing. **(06 hours)**

Lower Bound Theory: - Comparison Trees for searching & Sorting, Parallel Comparison trees, Oracle& Adversary Arguments, Lower Bounds through Reduction. **(04 hours)**

NP-Hard and NP-Complete Problems: -Basic concepts, Non-Deterministic Algorithms, Polynomial Time Algorithms, NP-hard & NP –complete classes, Cook's Theorem, Introduction to Approximation Algorithms. **(04 hours)**

Section- B

Design Techniques: -

Divide and Conquer: - General methods, Binary Search, Finding the Maximum & Minimum, Merge sort, Quick Sort & Selection sort, Strassen's Matrix, Multiplication. **(08 hours)**

Greedy Method: - General Methods, Optimal Storage on Tapes, Knapsack Problem, Job Sequencing with Deadlines, Optimal Merge Patterns, Single Source, shortest path. **(06 hours)**

Dynamic Programming: - General Methods, Multistage Graphs, I/O Knapsack, Reliability Design, Traveling Salesperson problem. **(04 hours)**

Back Tracking: - General Method, The 8- Queens Problem, Hamiltonian Cycles, Knapsack Problem. **(03 hours)**

Branch &Bound: - The method, I/O Knapsack Problem, Traveling Salesperson Problem. **(03 hours)**

BOOKS RECOMMENDED:

1. Fundamentals of Computer Algorithms. Ellis Horowitz, SartajSahni.
2. Data Structure & Algorithm J.M. Hopcraft , Ullman

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

` Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER **CREDITS: 4**

BRANCH: COMPUTER ENGINEERING

COURSE NO: PCS-502

COURSE TITLE: COMPUTER NETWORKS

DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
3	**1**	**0**	**100**	**50**

COURSE OUTCOMES **At the end of the course the student will be able to: -**	
CO1	Acquire a thorough understanding of the state-of-the-art modern network architectures, protocols, networked systems and applications.
CO2	Analyze the components required to build different types of networks and simple protocols of various network layers.
CO3	Propose the solution for developing networks for real time engineering and scientific applications.

Detailed Syllabus

Section- A

Introduction: Data Communication-communication system, synchronous and asynchronous systems, serial and parallel systems, dataflow-simplex, half-duplex, full-duplex, computer network-uses of computer network, categories of computer networks, protocol and standards, Reference Model-OSI and TCP/IP reference model, their comparison and critique, Network Topologies **(05 hours)**

Physical Layer: Data Transmission-Digital to Digital Conversion-Line Coding Scheme, Transmission Media, RS-232 Interface, Switching mechanisms and Comparison –circuit, packet, message, Modem and its types **(06 hours)**

Data Link Layer: Design Issues, Error Detection and Correction, Flow Control-Elementary of data-link protocol, Sliding Window Protocol, Example of Data Link Protocol (HDLC). **(06 hours)**

Medium Access Control Sub layer: Channel Allocation Problems, Multiple Access Protocol-ALOHA, Carrier Sense Multiple Access Protocols, Collision Free Protocols, IEEE standards-802.3, 802.4, 802.5. **(06 hours)**

Section- B

Network Layer - Design Issues, Routing Algorithms- The optimality principle, shortest path algorithm, flooding, distance vector routing, link state routing and hierarchical routing, Congestion Control- principles prevention policies, congestion control in virtual circuit subnet and datagram subnets, Traffic shaping algorithm - leaky bucket algorithm, token bucket algorithm, QOS, IP protocol, IP addresses, Internet Multicasting, Introduction to IPV6 ,IPV4 vs. IPV6, Internetworking devices –Repeaters, Hub, Bridges, Switches, Routers, Gateways. **(10 hours)**

Transport Layer: Transport Layer Services, Primitives, Issues, and elements of transport protocol, Introduction to TCP and UDP **(04 hours)**

Session and Presentation Layer- Design issues, services and primitives **(04 hours)**

Application Layer: FTP, DNS, E-Mail, Firewalls. **(04 hours)**

BOOKS RECOMMENDED:

1. Data Communication - William L. Schweber.
2. Computer Networks - Andrew S. TanenBaum.
3. Communication Network System for Computer - Davies &Barbq
4. Data Communication and networking - Behrouz A. Forouzan

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER **CREDITS: 4**

BRANCH: COMPUTER ENGINEERING

COURSE NO: PCS-503

COURSE TITLE: MICROPROCESSOR & INTERFACING

DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
3	**1**	**0**	**100**	**50**

COURSE OUTCOMES **At the end of the course the student will be able to: -**	
CO1	Understand the knowledge of general architecture, organization and instruction sets of 8085 and 8086 microprocessors.
CO2	Analyze architecture and operation of Programmable Interface Devices and realize the assembly language programming.
CO3	Create the interfacing of memory and various I/O devices with 8085 microprocessor.

Detailed Syllabus

Section- A

Architecture of 8085: Block diagram, Pin Description of 8085, Instruction Set and Instruction Format, Addressing Modes, Looping, Counting and Indexing. 8085 Interrupts. Interrupt handling in 8085, Enabling, disabling and masking of interrupts. **(10 hours)**

Counters and Time Delay Programs, Stack and Subroutines, Conditional Call and Return Instructions & Code Conversions, Timing diagram for different machine cycles. **(4 hours)**

Parallel Input/Output& Interfacing: - Basic Interfacing Concepts, Interfacing memory and I/O devices, Addressing memory, Interfacing a keyboard, Interfacing LED and seven segment displays. **(6 hours)**

Section- B

Programmable Interface Devices: - Basics of Programmable I/O, General Purpose Programmable Peripheral Devices – 8255A, 8259A, Direct Memory Access Controller – 8237. **(8 hours)**

Architecture of 8086 : Memory Address space and data organization, segment registers and memory segmentation, Generating memory addresses, IO address space, addressing modes, Minimum mode and Maximum mode, system timing, Instruction Set and Programming Structure of 8086. **(12 hours)**

BOOKS RECOMMENDED:

1. Microprocessor Architecture, Programmingand Applications with 8085 - Ramesh S. Gaonkar.
2. Microprocessor and Interfacing - Douglas V. Hall
3. Introduction to Microprocessors - AdityaMathur

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER **CREDITS: 3**

BRANCH: COMPUTER ENGINEERING

COURSE NO: PCS-504

COURSE TITLE: THEORY OF COMPUTATION

DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
2	**1**	**0**	**100**	**50**

COURSE OUTCOMES **At the end of the course the student will be able to: -**	
CO1	Understand the basic concepts of formal languages , finite automata techniques and various problems to minimize FA.
CO2	Apply various languages to construct context free grammar.
CO3	Evaluate problems relating to Push down automata and Turing Machines.

Detailed Syllabus

Section- A

Introduction: -Symbols, string Concatenation, alphabet, Language, Tree, Mathematical Induction Proofs, States, Transition Tables, Finite Automata, Regular Expressions, Push- down Automata, Turing Machine, Context Free grammars**.** **(8 hours)**

Finite Automata: - Deterministic Finite Automata (DFA), Designing, Non- deterministic finite Automata (NFA) without E-moves, Conversions, Equivalence, NFA with E-moves, Regular expression designing, Finite machine with output assigned, Moore and mealy machines, Conversion and Equivalence. **(12 hours)**

Section- B

Turing Machines: -Turing Hypothesis, Turing Computability, Non- deterministic, Multitape and other versions of Turing machines, Churches Hypothesis, Primitive Recursive functions, Universal Turing machines, decidability, Halting problem, Stack Automata. **(10 hours)**

Regular Grammar & Context free Languages: -Context Free Grammar, Context free Languages, reduced form of Grammar, Ambiguous and Non- Ambiguous grammar, acceptors and generators, Relations between Classes of Languages, Pumping lemma of regular sets, Chomsky's hierarchy of languages, derivation Trees. **(10 hours)**

BOOKS RECOMMENDED:

1. Introduction to Automata Languages & Computation — A.V. AHO, J. E. Hopcreft& J.D. Ullman
2. Introduction Theory of Computer Science — E. V. Krishna Moorthy

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER **CREDITS: 3**

BRANCH: COMPUTER ENGINEERING

COURSE NO: MOC-502

COURSE TITLE: SWAYAM/NPTEL

L	T	P	Marks Sessional
3	0	0	100

The department shall offer the SWAYAM / NPTEL course (12 weeks) out of the list of courses offered by SWAYAM around the time of commencement of the semester. However, the selected NPTEL course should not be similar to the regular courses offered as a part of the department curriculum.

The overall monitoring of the NPTEL course will be under the supervision of the teacher incharge of the department.

The NPTEL/SWAYAM certification course comprises of Assignments (25%) and Proctor Examination (Online examination MCQ's based = 75%) conducted at the end of the semester by IIT Madras as per the schedule.

The marks obtained by the student in the NPTEL/SWAYAM certification course will be tabulated by the concerned department.

Note :- *In case the student does not pass the certification exam or remains absent in the proctor examination, no certificate will be given to the candidate by the NPTEL and the student will be deemed to have failed in the course. The examination of the said NPTEL course will be taken by the department concerned in the next semester under the supervision of Examination Cell of GCET Jammu. The paper will be of 75 marks and assignment marks will be carried forward from the previous semester.*

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER **CREDITS:1.5**
BRANCH: COMPUTER ENGINEERING
COURSE NO.: PCS-512
COURSE TITLE: COMPUTER NETWORKS LAB

L	T	P	Marks Practical
0	0	3	75

LABORATORY OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Understand fundamental underlining principles of computer networking and functionality of layered network architecture.
CO2	Analyze performance of various communication protocols.
CO3	Practice packet/ file transfer between nodes.

Lab Experiments:

Experiment 1	To study different types of networking cables.
Experiment 2	To implement the cross-wired cable and straight through cable using crimping tool.
Experiment 3	To study about different networking devices.
Experiment 4	To connect two computers in a local area network and to share file between them.
Experiment 5	To study about IP addressing.
Experiment 6	To implement various topologies using the LAN trainer kit.
Experiment 7	To study the UDP protocol and TCP protocol using the LAN trainer software.
Experiment 8	WAP on bit stuffing and character stuffing using any language.

NOTE: **Additional Lab experiments/ practicals will be performed based on the course content requirements.**

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER **CREDITS:1.5**

BRANCH: COMPUTER ENGINEERING

COURSE NO.: PCS-513

COURSE TITLE: MICROPROCESSOR & INTERFACING LAB	**L**	**T**	**P**	**Marks Practical**
	0	**0**	**3**	**75**

LABORATORY OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Classify and apply the instruction set of 8085 and 8086 microprocessors.
CO2	Design, code and debug Assembly Language programs to implement simple programs.
CO3	Apply programming knowledge using the capabilities of the stack, the program counter

Lab Experiments:

Experiment 1	Block Transfer: - Data bytes are stored in memory locations from XX50H to XX5FH to insert an additional five bytes of data, it is necessary to shift the data string by five memory location. Write a program to store a data string from XX55H to XX64H. Use any 16 bytes of data to verify your program.
Experiment 2	Addition with Carry: Six bytes of data are stored in memory locations starting at XX50H. dd all the data bytes. Use register B to save any carry generated while adding the data bytes. Store the sum at two consecutive memory locations XX70H and XX71H.
Experiment 3	Checking for a particular data byte: A set of eight readings is stored in memory location starting at XX50H. Write a program to check whether a byte 40H exists in the set. If it does, stop checking, and display its memory location, otherwise output FFH.
Experiment 4	Write a program for BCD to Seven Segment LED code conversion.
Experiment 5	Write a program for Binary to ASCII code conversion.
Experiment 6	Write a program for BCD addition.
Experiment 7	Write a program for multiplication of Two 8 bit unsigned nos.
Experiment 8	Write a program to implement Stack operation.
Experiment 9	Write a program to implement procedures.
Experiment 10	Write a program to implement delay loops.

NOTE: **Additional Lab experiments/practicals will be performed based on the course content requirements.**

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER **CREDIT: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO.: PIT-502
COURSE TITLE: INDUSTRIAL TRAINING

L	T	P	Marks Practical
-	-	-	50

COURSE OUTCOMES **At the end of the course the student will be able to: -**	
CO1	Interact and study with a range of students and to practice multiple management skills, including communication, independent action and teamwork.
CO2	Understand the engineering code of ethics and be able to apply them as necessary.
CO3	Demonstrate knowledge of practical application of training.

Students are required to undertake 4 to 6 weeks Practical Training during the summer vacations in the field of Computer Engineering and applications in Govt./Semi-Govt./Private sector. Thereafter, each student shall be required to submit a report on the practical training to the concern department for evaluation.

Guidelines for evaluation of Practical Training: The evaluation shall be done by the departmental committee during 5th semester. The committee shall have a convener and at least two members.

Distribution of Marks as per the University statues:

Total Marks for Evaluation		= 50 marks	
i)	Report	= 15	30%
ii)	Viva-Voce & Presentation	= 25	50%
iii)	Level of IT	= 10	20%

Due weight age will be given to those who have opted for Industrial Training outside the State as well as keeping in view the profile of that Industry.

Award of the Marks:
Marks under (i), (ii) & (iii) will be awarded by the departmental committee constituted for the purpose.

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UNIVERSITY OF JAMMU,
JAMMU COURSE SCHEME
B.E 6th Semester Computer Engineering
For Examination to be held in the Year May 2021,2022,2023,2024.

Contact Hrs: 24

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATION			MARKS DISTRIBUTION		TOTAL	Credits	% Change
			L	T	P	Internal	External			
HMC-601	Humanities & Social Science Course	Managerial Economics	3	1	0	50	100	150	4	100%
*MOC-602	Massive Open Online Course	SWAYAM/NPTEL	3	0	0	100	-	100	3	100%
PCS-602	Professional Core Course	Operating System	2	1	0	50	100	150	3	100%
PCS-603	Professional Core Course	Compiler Design	2	1	0	50	100	150	3	100%
CSE-601	Professional Elective Course	Elective-I	2	1	0	50	100	150	3	100%
CSE-611	Professional Elective Course	Elective-I Lab	0	0	3	75	-	75	1.5	100%
PCS-612	Professional Core Course	Operating System Lab	0	0	3	75	-	75	1.5	100%
PCS-613	Professional Core Course	Web Designing & Android Development Lab	0	0	2	50	-	50	1	100%
TOTAL			**12**	**4**	**8**	**500**	**400**	**900**	**20**	

Elective-I	
CSE -601 (A)	Micro Controller & Embedded Systems
CSE -601 (B)	Computer Graphics
Elective-I Lab	
CSE -611 (A)	Micro Controller & Embedded Systems Lab
CSE -611 (B)	Computer Graphics Lab

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Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER **CREDITS: 4**

BRANCH: COMPUTER, ELECTRICAL & MECHANICAL ENGINEERING

COURSE NO: HMC-601

COURSE TITLE: MANAGERIAL ECONOMICS

DURATION OF EXAM: 3 HOURS

L	T	P	Marks Theory	Marks Sessional
3	1	0	100	50

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1	Understand about business environment of a country after acquiring good knowledge about micro economic concepts such as demand &utility analysis, consumer behavior, demand forecasting techniques and shall be a good decision maker.
CO2	Suggest producing the products at minimum cost by studying in detail about the cost curves and market structures.
CO3	Have knowledge of macroeconomics concepts such as, index numbers, business cycle,banking, inflation, etc. and will be able to apply them in day to day life.

Detailed Syllabus

Section A

Unit 1-Meaning and Importance of Managerial Economics: Introduction, Meaning, Scope of Managerial Economics ,,Role and responsibilities of managerial economist,Relationship of managerial economics with other disciplines: Importance of Managerial Economics in decision making,the basic process(steps) of decision making. **(5hrs)**

Unit 2-Demand Analysis: Introduction, Meaning of demand and Law of Demand, factors affecting demand ;exceptions to the law of demand;Elasticity of Demand(Price,income and cross elasticity of demand) **(6hrs)**

Unit 3-Consumer Behaviour: Cardinal utility analysis: Concept:law of diminishing marginal utility:law of equi marginal utility,Ordinal utility analysis:meaning and properties of Indifference curves and utility maximization(consumer equilibrium). **(5hrs)**

Unit 4- Demand Forecasting: Introduction, Meaning and importance of demand Forecasting : Methods or Techniques of Demand Forecasting, Survey Methods, Statistical Methods, Demand Forecasting for New Products**.** **(4hrs)**

Section B

Unit 5- Production and cost Analysis: Meaning of Production function, Isoquants(meaning and properties)law of variable proportions, law of returns to scale, Cost Analysis: Concept of Fixed, Variable, Total, Average & Marginal Costs &their relationships in short run. **(6hrs)**

Unit 6- market structure and pricing decisions - Introduction, Perfect Competition, monopoly (Price-Output Determination under Perfect Competition and monopoly in short run and long run),; kinked demand curve analysis of price stability(Sweezy's model) **(5hrs)**

Unit 7-Macroeconomic environment

Index Numbers-Meaning, construction and difficulties in measurement of Index number and its uses: meaning and phases of Trade /business cycle. **(5hrs)**

Unit 8-Banking and inflation-Functions of central bank and methods of credit control: functions of Commercial bank and methods of credit creation, Inflation(Types, effects and methods to control inflation). **(6hrs)**

BOOKS RECOMMENDED :

1. K.K.Dewett : Modern Economic Theory
2. H.L Ahuja : Advanced Economic Theory
3. M.L. Jhingan : Macro Economic Theory
4. P.N Chopra : Business Economics/Advanced Eco. Theory
5. .D,N,Dwivedi :Managerial Economics
6. A. Koutsoyiannis : Modern microeconomics

NOTE: There shall be total eight questions, four from each section. Each question carries 20 marks. Five questions will have to be attempted, selecting at least two from each section. Use of calculator is allowed.

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER **CREDITS: 3**

BRANCH: COMPUTER ENGINEERING

COURSE NO: MOC-602

COURSE TITLE: SWAYAM/NPTEL

L	T	P	Marks Sessional
3	0	0	100

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The overall monitoring of the NPTEL course will be under the supervision of the teacher incharge of the department.

The NPTEL/SWAYAM certification course comprises of Assignments (25%) and Proctor Examination (Online examination MCQ's based = 75%) conducted at the end of the semester by IIT Madras as per the schedule.

The marks obtained by the student in the NPTEL/SWAYAM certification course will be tabulated by the concerned department.

Note :- *In case the student does not pass the certification exam or remains absent in the proctor examination, no certificate will be given to the candidate by the NPTEL and the student will be deemed to have failed in the course. The examination of the said NPTEL course will be taken by the department concerned in the next semester under the supervision of Examination Cell of GCET Jammu. The paper will be of 75 marks and assignment marks will be carried forward from the previous semester.*

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER **CREDITS: 3**

BRANCH: COMPUTER ENGINEERING

COURSE NO: PCS-602

COURSE TITLE: OPERATING SYSTEM

DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
2	**1**	**0**	**100**	**50**

COURSE OUTCOMES **At the end of the course the student will be able to: -**	
CO1	Understand the structure, functionalities and design of an operating system, file systems and disk structure.
CO2	Acquire the knowledge about Processes, Scheduling, Synchronization and Deadlocks.
CO3	Apply various Memory management concepts to efficiently use memory.

Detailed Syllabus

Section - A

Introduction Concepts: - Operating System functions & Characteristics, Historical Evolution of O.S., O.S. Services, User O.S. Interface, Computer System Architecture, O.S. Design and Implementation and structure, System calls, System Programs, Virtual Machines, Spooling. **(4 hours)**

Process Management: - Study of state models, process Scheduling, Job Scheduling, Scheduling Criteria, Scheduling Algorithms, Multiple Process Scheduling. **(6 hours)**

Process Coordination: - Synchronization : Race-Conditions, critical–Section problems, semaphores, Bounded-Buffer Problem, Readers-writers Problem, Dining –Philosophers Problem . **(6 hours)**

Section- B

Deadlocks: Characteristics, Deadlock Prevention, Avoidance, Detection, Recovery. **(6 hours)**

Memory Management: Logical & Physical Address space, Contiguous & Non-Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Demand paged memory management, Page replacement, Allocation of Frames, Thrashing, Swapping & Overlays, Cache Memory. **(12 hours)**

File Systems& Disk Storage: Files - file concept, file structure, types, access methods, directory structure, allocation methods (contiguous, linked, and indexed), free-space management (bit vector, linked list, grouping),
Disk Structure, Disk Scheduling, Disk Management, Disk Formatting, Swap Space Management, RAID Structure. **(6 hours)**

BOOKS RECOMMENDED:

1. Operating System Concepts — Silberschatz and Galvin, Publisher Addison Wesley Inc.
2. Operating System Design & Implementation — Tanenbaum A.S, Publisher Pearson Education.
3. An Introduction to Operating Systems Concepts and Practice — Bhatt and Chandra, Publisher Prentice Hall of India Publication
4. Operating Systems – Internals and Design Principles — William Stallings, Seventh Edition, Prentice Hall

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

Examination to be held in the Year May 2021,2022,2023,2024

BRANCH: COMPUTER ENGINEERING **CREDITS:3**

COURSE NO: PCS-603 **Marks**

COURSE TITLE: COMPILER DESIGN	**L**	**T**	**P**	**Theory**	**Sessional**
DURATION OF EXAM: 3 HOURS	**2**	**1**	**0**	**100**	**50**

COURSE OUTCOMES **At the end of the course the student will be able to: -**	
CO1	Understand the internal organization and behaviour of compilers and other language processors
CO2	Analyze various phases, algorithms and techniques for implementing parse trees generation, errors handling and code optimization.
CO3	Acquire the generic skills to design and implement a compiler along with analysis of practical aspects.

Detailed Syllabus

Section- A

Introduction–Languages Processors, the typical structure of a Complier. **(03 hours)**

Lexical analysis –Role of Lexical Analyzer, Input buffering, A simple approach to Design of Lexical Analyzers, Regular Expressions, Finite Automata, Regular expression to Finite Automata, Conversion of NFA to DFA, Minimizing the number of states of a DFA. **(07 hours)**

The Syntactic Specification of Programming Languages –Definition of Grammars (Context free grammar), derivation, parse tree, ambiguity, non-context free language constructs. **(04 hours)**

Basics Parsing Techniques –Parsers- Shift reduce parsing, Operator precedence parsing, top -down parsing, Predicative parsers, LR parsers. **(08 hours)**

Section- B

Syntax directed translation- Syntax directed translation schemes. Implementation of syntax directed translators. **(04 hours)**

Intermediate code Generation - Intermediate code, postfix notation, three address code-quadruples triples, translation of Assignment statement, Boolean Expression, Statements that alter the flow of control. **(04 hours)**

Symbol Table Organization –The content of symbol table, Data structure of symbol table Run- Time memory Allocation-Static and Dynamic memory allocation, Static allocation of space – Activation trees, activation records, Procedure calls, parameter passing. **(05 hours)**

Error Detection and Recovery-Errors, lexical phase errors, syntactic phase errors, semantic errors. **(04 hours)**

Code optimization- Loop optimization, DAG Representation of basic blocks, Global data flow Analysis **(03hours)**

Code generation- Issues in the design of code generator, Peephole optimization, a simple code generator Register Allocation & Assignment. **(03 hours)**

BOOKS RECOMMENDED:

1. Principles of compiler design — Alfred V.Aho, Jeffrey D Ullman
2. Principles of compiler design — Aho v. Ullman, Sethi
3. Theory of parsing Translation & Compiling — Aho. Ullman
4. Compiler construction — MunishJha
5. Compilers Principles, Techniques & Tools — Alfred V. Aho, Monika S Lam, Ravi Sethi, Jeffrey D Ullman

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER **CREDITS: 3**

BRANCH: COMPUTER ENGINEERING

COURSE NO: CSE -601 (A)(ELECTIVE-I)

COURSE TITLE: MICROCONTROLLER & EMBEDDED SYSTEMS

DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
2	**1**	**0**	**100**	**50**

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Understand the general architecture of microcontroller and operation of embedded system using Aurdino and Raspberry pie.
CO2	Classify and apply the instruction set of 8051 and AVR microcontrollers and the use of different instructions.
CO3	Create the interfacing of memory and various I/O devices with microcontrollers.

Detailed Syllabus

Section- A

8051 Microcontroller: Introduction to Microcontrollers, Evolution, Microprocessors vs. Microcontrollers, MCS-51 Family Overview, Important Features, Architecture. 8051 Pin Functions, Architecture, Addressing Modes, Interrupt Organization, Processing Interrupts, Serial Port Interrupts, External Interrupts, and Interrupt Service Routines.Memory Address Decoding, 8031/51 Interfacing with External ROM And RAM. **(10 hours)**

Assembly programming and instruction of 8051: Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming.

8051 interfacing with 8255- Programming the 8255, 8255 interfacing, C programming for 8255. **(12 hours)**

Section- B

Embedded system : concept - characteristic features - architecture - application areas - specialties - embedded operating system - types - activities of an embedded OS like task, task scheduling, context switching, mutual exclusions and inter task communications - memory management and timer services - general architecture of OS - kernel - categories of embedded OS - examples - concept of arduino and raspberry pie development boards. **(10 hours)**

Introduction to AVR microcontroller: Overview of AVR family, AVR Microcontroller architecture, status register, Special function registers, RAM, ROM & EEPROM space, On-Chip peripherals, ATmega32 pin configuration & function of each pin, Fuse bits of AVR. **(05 hours)**

AVR assembly language programming: AVR data types and assembler directives, addressing modes of AVR, Data transfer, Arithmetic, Logic and Compare, Rotate and Shift, Branch and Call instructions, AVR studio setup for assembly language programming, AVR I/O Port Programming, Time delay loop, Look-up table. **(08 hours)**

BOOKS RECOMMENDED:

1. The 8051 Microcontroller and Embedded Systems, second edition, Pearson publications — Mazidi Muhammad Ali
2. The AVR Microcontroller and Embedded Systems using assembly and C - - Pearson Education. — Muhammad Ali Mazidi, SarmadNaimi and SepehrNaimi
3. Programming and Customizing the AVR Microcontroller — DhananjayGadre, McGraw Hill Education

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER
BRANCH: COMPUTER ENGINEERING **CREDITS:3**
COURSE NO: CSE-601(B)(ELECTIVE-I)
COURSE TITLE: COMPUTER GRAPHICS
DURATION OF EXAM: 3 HOURS

L	T	P	Marks Theory	Marks Sessional
2	1	0	100	50

COURSE OUTCOMES

At the end of the course the student will be able to: -

CO1	Acquire the knowledge regarding Computer Graphics display technologies, graphical primitives and Illumination models
CO2	Understand the basic output primitive drawing algorithms along with 2D and 3D transformation concepts to display the objects.
CO3	Apply the primitive drawing, polygon filling, clipping algorithms and implementing projection transformations and 3D object representation models.

Detailed Syllabus

Section A

Computer Graphic Systems:-Application areas of Computer Graphics, Overview of graphics systems,Video display devices, Raster scan displays, Video controller, Display Processors, Random Scan displays, Color CRT monitors, Graphics monitors and workstations, Direct View storage tubes, Flat Panel Displays. Three-dimensional viewing devices. Input devices:- Keyboards , Mouse, Trackball and space ball , Joysticks, Data glove, digitizers, image scanners, touch panels, Light pens, Voice systems, Hard copy Devices. Graphic software, Co-ordinate representations, Functions standards, PHIGS WORKSTATIONS**. (04 hours)**

Graphic Output primitives & their Attributes:- Points and lines, lines drawing algorithms : DDA algorithm, Bresenham's line algorithm, Circle generation algorithm, Midpoint circle Algorithm Ellipse Generating Algorithms: midpoint ellipse algorithm, Pixel Addressing and Object Geometry, Boundary Fill Algorithms, Flood Fill Algorithms, Character Generation, Line, Area-Fill and Character Attribute **(08 hours)**

Two Dimensional Geometric Transformations and Viewing :-Basic 2-D Transformation: Translation, Scaling, Rotation, Matrix Representation, Composite Transformations, Viewing pipeline, Window to Viewport coordinate Transformations, 2-D viewing functions. **(06 hours)**

Section B

Three Dimensional Transformations and Viewing :- Three Dimensional Concepts, Transformations and Viewing, Three Dimensional Display Methods, Three Dimensional Transformations; Three Dimensional Viewing Pipeline, Viewing Coordinates, Specifying the View Plane. **(06 hours)**

Parallel and Perspective Projections: -Parallel projections, Perspective projections**. (06 hours)**

Clipping: Clipping Operations, point clipping, line clipping procedures like Cohen -Sutherland line clipping, line clipping using non rectangular clip windows. Polygon clipping procedures: Sutherland Hodgeman polygon clipping**. (06 hours)**

Illumination Models and Shading: Light sources, Basic Illumination models, Shading models: Flat and Smooth Shading**. (04 hours)**

BOOKS RECOMMENDED:

1.	Computer Graphics	Donald Hearn,M.pauline Baker-phi
2.	Interactive Computer graphics	Newman and Sprowll-Tmh
3.	Computer Graphics:A Programming approach	Stevan Harrington-Tata McGraw-Hill
4.	Computer Graphics :Principles and practice	JD FoleyandA.V Dam,S.K Feiner, J.F Hughes –Pearson Education
5.	Computer Graphics	Z. Xiang, R.A. Plastock:, Second Edition, Schaum's Outlines, TataMcGraw-Hill
6.	Introduction to Computer Graphics	N. Krishnamurthy -Tata McGraw-Hill.

NOTE: There shall be total Eight Questions of 20 marks each; four questions from each section and students have to attempt five questions selecting at least two from each section. Use of Calculator is allowed

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER **CREDITS: 1.5**

BRANCH: COMPUTER ENGINEERING

COURSE NO.: CSE -611 (A) (ELECTIVE-I)

COURSE TITLE: MICRO CONTROLLER & EMBEDDED SYSTEMS LAB

L	T	P	Marks Practical
0	0	3	75

LABORATORY OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Design, code and debug Assembly Language programs to implement simple programs.
CO2	Interface peripherals like switches, LEDs, stepper motor, Traffic lights controller, etc.
CO3	Apply programming language using AVR microcontroller kit.

Lab Experiments:

Experiment 1	Study and familiarization of 8051 Microcontroller trainer kit
Experiment 2	Assembly Language Program for addition of 8-bit numbers stored in an array
Experiment 3	Assembly Language Program for Multiplication by successive addition of two 8-bit numbers
Experiment 4	Assembly Language Program for finding largest no. from a given array of 8-bit numbers
Experiment 5	Assembly Language program to arrange 8-bit numbers stored in an array in ascending Order
Experiment 6	Stepper motor control by 8051 Microcontroller
Experiment 7	Interfacing of 8-bit ADC 0809 with 8051 Microcontroller
Experiment 8	Interfacing of 8-bit DAC 0800 with 8051 Microcontroller and Waveform generation using DAC
Experiment 9	Implementation of Serial Communication by using 8051 serial ports
Experiment 10	Study of AVR Controller.
Experiment 11	Assembly Language Programs using AVR.

NOTE: **Additional Lab experiments/practicals will be performed based on the course content requirements.**

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER **CREDITS: 1.5**

BRANCH: COMPUTER ENGINEERING

COURSE NO.: CSE -611 (A) (ELECTIVE-I)

COURSE TITLE: COMPUTER GRAPHICS LAB

L	T	P	Marks Practical
0	0	3	75

LABORATORY OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Draw line, Circle, Ellipse using various algorithms.
CO2	Perform various Transformations on graphical primitive.
CO3	Perform Line Clipping and polygon filling.

Lab Experiments:

Experiment 1	Introduction to Borland Graphics Interface (BGI) and graphics libraries such as OPENGL, Cairo
Experiment 2	Simple DDA line drawing program
Experiment 3	Bresenham's line drawing program.
Experiment 4	Bresenham's circle drawing algorithm
Experiment 5	Implement midpoint circle drawing algorithm
Experiment 6	Implement ellipse drawing algorithm
Experiment 7	Performing transformations in 2D space
Experiment 8	Performing 3D transformations
Experiment 9	Draw and fill shapes.
Experiment 10	Cohen Sutherland line clipping program

NOTE: **Additional Lab experiments/practicals will be performed based on the course content requirements. Implement these programs using C/C++**

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER **CREDITS: 1.5**

BRANCH: COMPUTER ENGINEERING

COURSE NO.: PCS-612

COURSE TITLE: OPERATING SYSTEM LAB

L	T	P	Marks Practical
0	0	3	75

LABORATORY OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Understand the basic concepts of UNIX, LINUX commands
CO2	Apply the knowledge of Shell programming to develop programs.
CO3	Apply Semaphores to solve various problems.

Lab Experiments:

Experiment 1	Learning Basic Features and Operating Environment of UNIX and LINUX.
Experiment 2	Introduction to Shell and Shell Commands
Experiment 3	Designing Programs using the concept of Shell Programming.(at least 5 programs)
Experiment 4	Usage of Vi Editor of UNIX.
Experiment 5	Programming with Semaphores

NOTE: **Additional Lab experiments/ practicals will be performed based on the course content requirements.**

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER **CREDIT: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO.: PCS-613
COURSE TITLE: WEB DESIGNING & ANDROID LAB

L	T	P	Marks Practical
0	0	2	50

LABORATORY OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Remember the role of languages like HTML, DHTML, CSS,Javascript and android
CO2	Implement web pages using HTML, Cascading Style Sheets and Javascript.
CO3	Develop mobile applications using Android

Lab Experiments:

Experiment 1	HTML code for displaying name image and hyperlinks
Experiment 2	HTML code for displaying contents styled with CSS.
Experiment 3	HTML code for accepting a form.
Experiment 4	Program to create frame and table using HTML
Experiment 5	Program to create functions using Javscript.
Experiment 6	Program of form validation using Javascript.
Experiment 7	Design a website on your own using HTML,CSS, Javascript.
Experiment 8	Develop an android application representing a simple calculator
Experiment 9	Develop an android application for working with notification
Experiment 10	Develop an android application for connecting to internet and sending e-mail.
Experiment 11	Develop an android application for working with device camera

NOTE: **Additional Lab experiments/practicals will be performed based on the course content requirement.**