

**INSTITUTE VISION**

"To be a preferred institution in Engineering Education by achieving excellence in teaching and research and to remain as a source of pride for its commitment to holistic development of individual and society"

INSTITUTE MISSION

"To continuously strive for the overall development of students by educating them in a state-of-the-art-infrastructure, by retaining the best practices, faculties and inspire them to imbibe real time problem solving skills, leadership qualities, human values and societal commitments, so that they emerge as competent professionals".

DEPARTMENT VISION

"To be a center of excellence in providing education in the field of Computer Science and Engineering to produce technically competent and socially responsible IT professionals"

DEPARTMENT MISSION

"To provide a theoretical foundation in computing with the exposure of latest tools and technologies, IT infrastructure and encourage students for continuous learning to make them competent professionals"

PROGRAM EDUCATIONAL OBJECTIVES (PEO's) :

- 1 Pursue a successful career in the field of Computer Science & Engineering utilizing his/her knowledge and contribute to the profession as an excellent employee, or as an entrepreneur.
- 2 Apply the knowledge of mathematics & computer science fundamentals to analyze & formulate the solution to solve real time problems.
- 3 Exhibit the professional and ethical values, communication & teamwork skills, lifelong learning, multidisciplinary approach to address computer engineering and societal issues.

PROGRAM OUTCOMES (PO's) :

- 1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2 **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3 **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4 **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable



development.

- 8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11 **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12 **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO's) :

PSO1: Understand, design and analyze computer programs in the areas related to Algorithms, System Software, Web design, Bigdata Analytics, Machine Learning and Networking.

PSO2: Make use of modern computer tools for creating innovative career paths to be an entrepreneur and desire for higher studies.

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Student Help Desk

Sl. No.	Purpose	Contact Person	
		Faculty	Instructor
1.	Academics /Attestations / Exam forms signature.	Dr. Parashuram Baraki	Mr. A. R. Bhiste
2.	Industry- Institute-Interaction (Alliance/ MoU, Ind. Visit etc.)	Mrs. A. A. Daptardar	--
3.	Seminar/FDP/Workshops/HIT-QUEST/Conference/ Alumni	Sri. S. G. Gollagi Mrs. A. A. Daptardar	Mrs. Rutuja Patil
4.	Project Coordinator	Sri. R. R. Patil	--
5.	STAC/Competitive Exams/VTU Exams (GATE/CAT/GRE etc., Ranks in VTU exams.)	Mrs. S. B. Hosagoudra Sri. C. R. Belavi	--
6.	Training & Placement	Sri. M. G. Huddar	--
7.	NBA Activities	Sri. S. V. Manjaragi	Mr. A. K. Badakar
8.	Technical Seminar Coordinator	Sri. S. G. Gollagi	--
9.	KSCST	Sri. N K Honnagoudar	--
10.	ISTE	Sri. M. A. Chitale	--
11.	IEEE coordinator /LIC/Smart India Hackathon	Sri. M. G. Huddar	--
12.	Website	Sri. C. R. Belavi	Mrs. Rutuja Patil
13.	VTU Portal updation	Sri. M. A. Gholap	Mr. A. R. Bhiste
14.	Internship Coordinator	Sri. R. R. Patil	--
15.	Feedback /Edusat/e-Learning/EMS/ AICTE/ IA Coordinator	Sri. M. A. Chitale	Mr. A. K. Badakar
16.	Robo-Vidya / IT Maintenance	Sri. M. A. Gholap	Mr. A. B. Bennoli
17.	Dept. Library	Mr. A. R. Bhiste	
Institute Level			
19.	Student Welfare Convener	Sri. R. R. Patil (9845455422)	
20.	TP Cell Coordinator	Sri. Santosh Sajjan(9480849332)	
21.	Anti Ragging Convener	Sri. M.S.Futane (9480849334)	
22.	Anti Squad Convener	Sri. K.M.Akkoli (9739114856)	
23.	Anti Sexual Harassment Convener	Smt. J B Patil (9449308355)	
24.	Grievance redressal Convener	Sri. S S Tabhaj (9901398134)	
25.	Extra-Curricular Activities	Sri. T S Vandali (9686235904)	

2.0

Departmental Resources

Department of Computer Science and Engineering was established in the year 1996 and is housed in a total area of 1206 Sq. Mtrs.

2.1

Faculty Position

Sl.No.	Category	No. in Position	Average experience (in years)
1.	Teaching faculty	11	12
2.	Technical Supporting Staff	06	07
3.	Helper staff	03	19

**2.2**

Major Laboratories

Sl.No.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested (Rs. in Lakhs)
1.	System Programming Lab.	70	12.64
2.	C Programming Lab.	70	18.90
3.	Algorithms/ Network Lab.	70	11.80
4.	Microprocessors Lab.	70	21.92
5.	Web Programming/DBA Lab.	70	09.07
6.	Computer Center	220	197.18

Total Investment in the Department**Rs. 271.51 Lakhs****3.0**

Teaching Faculty Details

Sl. No.	Name	Designation	Qualification	Specialization	Professional Membership	Teaching Exp (in yrs)	Phone No.
1	Dr.Parashuram Baraki	H.O.D.& Prof.	M.Tech, Ph.D	CSE	LMISTE	17.00	9686042385
2	Prof. S. G. Gollagi	Asst. Prof.	M. Tech.(Ph.D)	CSE	LMISTE	20.06	9880383883
3	Prof. N. K. Honnagoudar	Asst. Prof.	M.E	ECE	LMISTE	16.06	9449495302
4	Prof. S. V. Manjaragi	Asst. Prof.	M. Tech.(Ph.D)	CSE	LMISTE	14.06	9986658309
5	Prof. R. R. Patil	Asst. Prof	M. Tech	CSE	LMISTE	13.06	9845455422
6	Prof. A.A. Daptardar	Asst. Prof	M. Tech.	CSE	LMISTE	11.08	9620851002
7	Prof. C.R. Belavi	Asst. Prof	M. Tech.	CSE	LMISTE	10.06	7829241219
8	Prof. M.G. Huddar	Asst. Prof	M. Tech.(Ph.D)	CSE	LMISTE	09.06	7411043272
9	Prof. S. B. Hosagoudra	Asst. Prof	M. Tech	CSE	LMISTE	08.06	9535287338
10	Prof. M. A. Chitale	Asst. Prof	M. Tech.	CNE	LMISTE	05.06	9480787474
11	Prof. M. A. Gholap	Asst. Prof	M. Tech.	CSE	LMISTE	04.06	7353122323



4.0

Institute Academic Calendar

	S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi & Accredited at 'A' Grade by NAAC and Recognized Under Section 2(f) of UGC Act, 1956.	IQAC
		File I-11
		2018-19 (Even)
		Rev: 01

CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2018-19 (Even)

Date	Events	
01-02-2019	Commencement of IV/VI/VIII Semester Classes	February-2019
22-02-2019	EDP Activities	S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
25-02-2019	Commencement of II Semester Classes	March-2019
02-03-2019	Annual Sports Meet	S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
14-03-2019 to 16-03-2019	First Internal Assessment of IV/VI/VIII Semester	04- Maha Shivaratri 05- Maha Dasoha 21- Holi
20-03-2019	Feed Back-1, Display of First Internal Assessment Marks & Submission of Feedback-1 report to office	April-2019
21-03-2019	HIT Quest - 2019	S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
22-03-2019	HIT SAMBHRAMA-2019	06- Chandraman Ugadi 14-Dr. B. R. Ambedkar Jayanti 17-Mahaveer Jayanti 19-Good Friday
23-03-2019	Techno-Vision 2019	May-2019
11-04-2019 to 13-04-2019	Second Internal Assessment of IV/VI/VIII Sem. First Internal Assessment of II Semester	S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
15-04-2019	Feed Back-2	01- Labours Day, 07- Basava Jayanthi
18-04-2019	Display of Internal Assessment Marks & Submission of Feedback-1 report to office	June -2019
23-04-2019	Technical Activities under Professional Bodies	S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
26-04-2019	NSS/Red Cross activities	05- Qutub-E-Ramazan
16-05-2019 to 18-05-2019	Third Internal Assessment of IV/VI/VIII Sem. Second Internal Assessment of II Semester	
22-05-2019	Display of Internal Assessment Marks	
20-05-2019 & 21-05-2019	Lab Internal Assessment of IV/VI/VIII Semester	
22-05-2019	Graduation Day - 2019	
23-05-2019	Project Exhibition of VIII Semester	
23-05-2019	Last Working Day of IV/VI/VIII Semester	
27-05-2019 to 07-06-2019	Practical Exams of IV/VI Semester Theory Exams of VIII Semester	
10-06-2019 to 16-07-2019	Theory Exams of IV/VI Semester	
10-06-2019 & 11-06-2019	Lab Internal Assessment of II Semester	
11-06-2019 to 17-06-2019	Project Viva-Voce of VIII Semester	
13-06-2019 to 15-06-2019	Third Internal Assessment of II Semester	
17-06-2019	Last Working Day of II Semester	
19-06-2019 to 29-06-2019	Practical Exams of II Semester	
01-07-2019 to 16-07-2019	Theory Exams of II Semester	

Dr. Shilpa Shrigiri
IQAC Co-ordinator



Dr. S C Kamate
PRINCIPAL
Hirasugar Institute of Technology
NIDASOSHI-591 236



5.0

Department Academic Calendar

S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi & Accredited at 'A' by NAAC and Recognized Under Section 2(f) of UGC Act, 1956		CSE_COE
		File I-II
		2018-19 (Even)
		Rev: 01
CALENDER OF EVENTS FOR THE ACADEMIC YEAR 2018-19 (EVEN)		
Date	Events	
01-02-2019	Commencement of IV/VI/VIII Semester Classes	February-2019
13-02-2019	Department Association Activity-1	S M T W T F S
20-02-2019	Department Association Activity-2	
22-02-2019	EDP Activities	3 4 5 6 7 8 9
25-02-2019	Commencement of II Semester Classes	10 11 12 13 14 15 16
27-02-2019	Department Association Activity-3	17 18 19 20 21 22 23
02-03-2019	Annual Sports Meet	24 25 26 27 28
06-03-2019	Department Association Activity-4	March-2019
14-03-2019 to 16-03-2019	First Internal Assessment of IV/VI/VIII Semester	S M T W T F S
20-03-2019	Feed Back-1, Display of First Internal Assessment Marks & Submission of Feedback-1 report to office	
21-03-2019	HIT Quest - 2019	3 4 5 6 7 8 9
22-03-2019	HIT SAMBHRAMA-2019	10 11 12 13 14 15 16
23-03-2019	Techno-Vision 2019	17 18 19 20 21 22 23
27-03-2019	Department Association Activity-5	24 25 26 27 28 29 30
03-04-2019	Department Association Activity-6	31
11-04-2019 to 13-04-2019	Second Internal Assessment of IV/VI/VIII Sem. First Internal Assessment of II Sem.	04- Maha Shivaratri 05- Maha Dasoha 21- Holi
15-04-2019	Feed Back-2	April-2019
18-04-2019	Display of Internal Assessment Marks & Submission of Feedback-1 report to office	S M T W T F S
23-04-2019	Technical Activities under Professional Bodies	
24-04-2019	Department Association Activity-7	7 8 9 10 11 12 13
26-04-2019	NSS/Red Cross activities	14 15 16 17 18 19 20
08-05-2019	Department Association Activity-8	21 22 23 24 25 26 27
16-05-2019 to 18-05-2019	Third Internal Assessment of IV/VI/VIII Sem. Second Internal Assessment of II Sem.	28 29 30
22-05-2019	Display of Internal Assessment Marks	06- Chandraman Ugadi 14-Dr. B. R. Ambedkar Jayanti 17-Mahaveer Jayanti 19-Good Friday
20-05-2019 & 21-05-2019	Lab Internal Assessment of IV/VI/VIII Semester	May-2019
22-05-2019	Graduation Day - 2019	S M T W T F S
23-05-2019	Project Exhibition of VIII Sem.	
23-05-2019	Last Working Day of IV/VI/VIII Semester	5 6 7 8 9 10 11
27-05-2019 to 07-06-2019	Practical Exams of IV/VI/VIII Semester	12 13 14 15 16 17 18
10-06-2019 to 16-07-2019	Theory Exams of IV/VI/VIII Semester	19 20 21 22 23 24 25
10-06-2019 & 11-06-2019	Lab Internal Assessment of II Sem.	26 27 28 29 30 31
11-06-2019 to 17-06-2019	Project Viva-Voce of VIII Sem.	01- Labours Day, 07- Basava Jayanthi
13-06-2019 to 15-06-2019	Third Internal Assessment of II Sem.	June -2019
17-06-2019	Last Working Day of II Semester	S M T W T F S
19-06-2019 to 29-06-2019	Practical Exams of II Semester	
01-07-2019 to 16-07-2019	Theory Exams of II Semester	9 10 11 12 13 14 15
		16 17 18 19 20 21 22
		23 24 25 26 27 28 29
		30
		05- Qutub-E-Ramazan

Prof. Shilpa B. Hosagoudra
STAC Coordinator

Dr. Parashuram Baraki
HOD
Computer Science & Engg.
HIT, Nidasoshi



6.0

Scheme of Teaching & Examination

Scheme of Teaching and Examination 2017-2018

Choice Based Credit System (CBCS)

B.E. Computer Science & Engineering/ B.E. Information Science & Engineering

IV SEMESTER

S.N	Course Code	Title	Teaching Department	Teaching Hours /Week		Examination				Credits
				Theory	Practical/ Drawing	Durati on in hours	SEE Marks	CIE Marks	Total Marks	
1	17MAT41	Engineering Mathematics - IV	MATHS	04		03	60	40	100	4
2	17CS42	Object Oriented Concepts	CS/IS	03		03	60	40	100	3
3	17CS43	Design and Analysis of Algorithms	CS/IS	04		03	60	40	100	4
4	17CS44	Microprocessors and Microcontrollers	CS/IS	04		03	60	40	100	4
5	17CS45	Software Engineering	CS/IS	04		03	60	40	100	4
6	17CS46	Data Communication	CS/IS	04		03	60	40	100	4
7	17CSL47	Design and Analysis of Algorithm Laboratory	CS/IS	01-Hour Instruction 02-Hour Practical		03	60	40	100	2
8	17CSL48	Microprocessors Laboratory	CS/IS	01-Hour Instruction 02-Hour Practical		03	60	40	100	2
9	17KL/CPH39/49	Kannada/Constitution of India, Professional Ethics and Human Rights	Humanities	01		01	30	20	50	01
TOTAL				Theory: 24hours Practical: 06 hours		25	510	340	850	28



Kannada/Constitution of India, Professional Ethics and Human Rights: 50 % of the programs of the Institution have to teach Kannada/Constitution of India, Professional Ethics and Human Rights in cycle based concept during III and IV semesters.

2. Audit Course:

(i) *All lateral entry students (except B.Sc candidates) have to register for Additional Mathematics – II, which is 03 contact hours per week.

1	17MATDIP41	Additional Mathematics – II	Maths	03		03	60	--	60	--
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(ii) Language English (Audit Course) be compulsorily studied by all lateral entry students (except B.Sc candidates)



Subject Title	Engineering Mathematics-IV		
Subject Code	17MAT41	IA Marks	40
Number of Lecture Hrs / Week	04	Exam Marks	60
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 04			

FACULTY DETAILS:

Name: Prof. S. A. Patil	Designation: Asst.Professor	Experience: 8.5
No. of times course taught: 06	Specialization: Mathematics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science Engineering	III	Engineering Mathematics-III

2.0 Course Objectives

The purpose of this course is to make students well conversant with numerical methods to solve ordinary differential equations, complex analysis, sampling theory and joint probability distribution and stochastic processes arising in science and engineering.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to draw and use modeling software's to generate

CO	Course Outcome	Pos
C210.1	Use appropriate single step and multi-step numerical methods to solve first and second order ordinary differential equations arising in flow data design problems.	PO1,PO2, PO3,PO12
C210.2	Explain the idea of analyticity, potential fields residues and poles of complex potentials in field theory and electromagnetic theory.	PO1,PO2, PO3,PO12
C210.3	Employ Bessel's functions and Legendre's polynomials for tackling problems arising in continuum mechanics, hydrodynamics and heat conduction.	PO1,PO2, PO3,PO12
C210.4	Describe random variables and probability distributions using rigorous statistical methods to analyze problems associated with optimization of digital circuits, information, coding theory and stability analysis of systems.	PO1,PO2, PO3,PO12
C210.5	Apply the knowledge of joint probability distributions and Markov chains in attempting engineering problems for feasible random events.	PO1,PO2, PO3,PO12
Total Hours of instruction		50

4.0 Course Content**MODULE-I****(10 Hours)**

Numerical Methods: Numerical solution of ordinary differential equations of first order and first degree, Taylor's series method, modified Euler's method, Runge - Kutta method of fourth order. Milne's and Adams-Bashforth predictor and corrector methods (No derivations of formulae).

MODULE-II**(10Hours)**

Numerical Methods: Numerical solution of second order ordinary differential equations, Runge-Kutta method and Milne's method. **Special Functions:** Series solution of Bessel's differential equation leading to $J_n(x)$ -Bessel's function, Bessel orthogonality. Series solution of Legendre's differential equation leading to $P_n(x)$ -Legendre polynomials. Rodrigue's formula, problems

**MODULE-III****(10 Hours)**

Complex Variables: Review of a function of a complex variable, limits, continuity, differentiability. Analytic functions-Cauchy-Riemann equations in Cartesian and polar forms. Properties and construction of analytic functions. Complex line integrals-Cauchy's theorem and Cauchy's integral formula. Residue, poles, Cauchy's Residue theorem (without proof) and problems. **Transformations:** Conformal transformations, discussion of transformations: $w = z^2$, $w = e^z$, $w = z + 1/z$ and bilinear transformations-problems.

MODULE-IV**(10 Hours)**

Probability Distributions: Random variables (discrete and continuous), probability mass/density functions. Binomial distribution, Poisson distribution. Exponential and normal distributions, problems. **Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient.

MODULE-V**(10 Hours)**

Sampling Theory: Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. **Stochastic process:** Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability simple problems.

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	Common to all	Common to all engineering Subjects	Signal and Analysis, Field Theory, Thermodynamics, Fluid Dynamics etc

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Numerical methods are used to solve engineering problems. For examples will be drawn from a variety of engineering problems, including heat transfer, vibrations, dynamics, fluid mechanics, etc.
02	Special functions are used to wave propagation and scattering, fiber optics, heat conduction in solids, and vibration phenomena.
03	In signal processing, sampling is the reduction of a continuous signal to a discrete signal. A common example is the conversion of a sound wave (a continuous signal) to a sequence of samples (a discrete-time signal).

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Sampling Theory

8.0 Books Used and Recommended to Students

Text Books
1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2015.
Reference Books
1. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
2. B.V.Ramana: "Higher Engineering Mathematics" Tata McGraw-Hill, 2006.
3. H. K. Dass and Er. RajnishVerma: "Higher Engineerig Mathematics", S. Chand publishing, 1st edition, 2011.
Additional Study material & e-Books
1. N.P.Bali & Manish.Goyal, A Text book of Engineering Mathematics, 7 th edition, Laxmi Publications.



9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.khanacademy.org/
3. http://www.class-central.com/subject/math

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	+ Plus Magazine	https://plus.maths.org/issue44 .
2	Mathematics Magazine	www.mathematicsmagazine.com

11.0 Examination Note

Internal Assessment: 20+10=30 Marks

30 Marks: Internal Assessment test

10 Marks: Assignments

Scheme of Evaluation for Internal Assessment (30 Marks)

- a) Internal Assessment test in the same pattern as that of the main examination (Avg. of three Tests): 30 marks.
- b) Class work (Assignment writing on all modules): 10 Marks.

SCHEME OF EXAMINATION:

Two main questions to be set from syllabus covered up to IA tests. Student must answer two full main questions and each question is for 15 Marks.

Q.No-I or Q.No-II	= 15 Marks
Q.No-III or Q.No-IV	= 15 Marks
Total	= 30 Marks

Average of three IA's will be added with assignment marks and final evaluation will be done for 40 marks.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
MODULE 1	1	Numerical solution of ordinary differential equations of first order & first degree	20
	2	Taylor's series method & Problems.	
	3	Modified Euler's method	
	4	Problems	
	5	Runge -Kutta method of fourth order	
	6	Problems	
	7	Milne's predictor and corrector method	
	8	Problems	
	9	Adams-Bashforth predictor and corrector method	
	10	Problems.	
MODULE 2	11	Numerical solution of second order ordinary differential equations	20
	12	Runge -Kutta method	
	13	Milne's method	
	14	Problems.	
	15	Series solution of Bessel's differential equation leading to $J_n(x)$	
	16	Properties of Bessel's functions.	
	17	$J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$ & $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$	
	18	Orthogonality of Bessel's functions.	
	19	Series solution of Legendre differential equation leading to $J_n(x)$ -Legendre polynomials	
	20	Rodrigue's formula, problems	



MODULE 3	21	Review of a function of a complex variable, limits, continuity, differentiability	20
	22	Analytic functions-Cauchy-Riemann equation in Cartesian form	
	23	Cauchy-Riemann equation in Polar form	
	24	Properties and construction of analytic functions	
	25	Complex line integrals-Cauchy's theorem	
	26	Cauchy's integral formula	
	27	Residue, poles, Cauchy's Residue theorem	
	28	Conformal Transformations and discussion of transformations of $w = z^2$, $w = e^z$	
	29	Discussion of Transformations: $w = z + (1/z)$.	
	30	Bilinear transformations & Problems	
MODULE 4	31	Random variables (discrete and continuous)	20
	32	Probability mass/density functions	
	33	Binomial distribution.	
	34	Poisson distribution.	
	35	Exponential distribution.	
	36	Normal distributions.	
	37	Problems.	
	38	Joint Probability distribution for two discrete random variables	
	39	Expectation, covariance.	
	40	Correlation coefficient	
MODULE 5	41	Sampling & Sampling distributions	20
	42	standard error, test of hypothesis for means and proportions	
	43	confidence limits for means	
	44	student's t-distribution	
	45	Chi-square distribution as a test of goodness of fit.	
	46	Stochastic processes, probability vector	
	47	stochastic matrices, fixed points,	
	48	regular stochastic matrices	
	49	Markov chains	
	50	higher transition probability simple problems	

14.0

QUESTION BANK

MODULE-1: NUMERICAL METHODS

- Solve $dy/dx = x^2y-1$ with $y(0)=1$ using Taylor's series method and find $y(0.1)$ consider upto 4th degree terms.
- Use Runge Kutta fourth order method to solve $dy/dx = y^2 - x^2/y^2 + x^2$ with $y(0)=1$ and find y for $x=0.2$ and 0.4 take $h=0.2$
- Given $dy/dx = xy + y^2$, $y(0)=1$, $y(0.1)=1.1169$, $y(0.2)=1.2773$, $y(0.3)=1.5049$ find $y(0.4)$ accurate upto three decimal places using Milne's predictour corrector method.
- Applying R-K method to find an approximate value of y for $x=0.2$ in steps of 0.1 of $dy/dx = x + y^2$ given that $y=1$ when $x=0$.
- Given $dy/dx = x^2(1+y)$ & $y(1)=1, y(1.1)=1.233, y(1.2)=1.548, y(1.3)=1.979$. Evaluate $y(1.4)$ by Adams Bash Fourth method
- Employ Taylor's series method to find an approximate solution correct to fourth decimal places for the following initial value problem at $x=0.1$ & 0.2 $dy/dx = 2y + 3e^x$, $y(0)=0$.
- Applying R-K method to find the approximate value of y for $x=0.2$ in step of $x=0.1$ given that $dy/dx = x + y^2$ with $y(0)=1$.
- Using Milne's predictour corrector method find y where $x=0.8$ given $dy/dx = x - y^2$, $y(0)=0$, $y(0.2)=0.02$, $y(0.4)=0.0795$, $y(0.6)=0.1762$. Applying corrector formula twice.
- Employ R-K method of 4th order to solve the equation $dy/dx = 3x + y/2$, $y(0)=1$ at $x=0.2$ taking step length $h=0.1$
- Solve the differential equation $dy/dx = x^2 + y^2$ given $y(0)=1$ to find the value of $y(0.1)$ by using Taylor's series method of order.
- Using modified Euler's method, solve the equation $dy/dx = 1/x + y$, $y(0)=1$ in steps of 0.5 at $x=1$



- Using Adams Bash fourth predictor correct method find y when $x=0.8$ given $dy/dx = x - y^2$, $y(0)=0$, $y(0.2)=0.02$, $y(0.4)=0.0795$, $y(0.6)=0.1762$. Apply correct formula twice.
- Using Taylor's series method to find y at the point $x=0.1$ & $x=0.2$ given that $dy/dx = x^2 + y^2$, $y(0)=1$
- From the data given below find y at $x=1.4$ using Milne's predictor corrector method $y' = x^2 + y/2$

x	1	1.1	1.2	1.3
y	2	2.2156	2.4649	2.7514

MODULE-2: NUMERICAL METHODS AND SPECIAL FUNCTIONS

- Use R- K method to solve $y = xy^2 - y^2$ for $x = 0.2$ correct to 4 decimal places. $y(0) = 1$ & $y'(0) = 0$
- Given $y'' + xy' + y = 0$, $y(0)=1$, $y'(0)=0$, obtain y for $x=0.1$ & $x=0.3$ Milne's method & calculate $y(0.4)$.
- Obtain the series solution of Bessel's differential equation $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + (x^2 - n^2)y = 0$ in the form of $y = A J_n(x) + B J_{-n}(x)$
- If α and β are two distinct roots of $J_n(x) = 0$, then prove that $\int_0^1 x J_n(\alpha x) J_n(\beta x) dx = 0$ if $\alpha \neq \beta$.
- Using R-K method of order four, solve $y'' = y + xy'$, $y(0) = 1$, $y'(0) = 1$ to find $y(0.2)$ & $y'(0.2)$.
- S.T. i) $J_{1/2} = \sqrt{2/\pi x} \sin x$, ii) $J_{-1/2} = \sqrt{2/\pi x} \cos x$.
- Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre's polynomials.
- Obtain the series solution of Bessel's differential equation in the form $y = A J_n(x) + B Y_n(x)$
- Establish the Rodrigue's formula for Legendre polynomials. S.T. i) $P_n(1)=1$, ii) $P_n(-1) = (-1)^n$
- Express $f(x) = x^3 + 2x^2 - x - 3$ in terms of Legendre polynomials

MODULE-3: COMPLEX VARIABLES AND TRANSFORMATIONS

- Derive Cauchy-Riemann equations in the Cartesian form.
- Derive Cauchy-Riemann equations in the Polar form.
- P.T if $f(z) = u + iv$ is an analytic then the family of curves $u(x,y)=C_1$, $v(x,y)=C_2$, C_1 & C_2 being Constants, intersect each other orthogonally
- S.T $w = \log z$, $z \neq 0$ is analytic & find dw/dz .
- S.T $f(z) = z^n$, where n is a positive is analytic & hence find its derivative.
- Find the analytic function $f(z) = u + iv$ given $u - v = e^x(\cos y - \sin y)$
- Find the analytic function $f(z)$ as a function of z given that the sum of its real & imaginary parts is $x^3 - y^3 + 3xy(x - y)$
- Discuss the conformal transformation of $w = z^2$
- Discuss the conformal transformation of $w = e^z$
- Find the bilinear transformation which map the points $z = 1, i, -i$ under this transformation find the image of $|z| < 1$.
- Find the bilinear transformation which maps $z = \infty, i, 0$ into $w = -1, -i, 1$. Also find the pts of transformation
- State & prove Cauchy integral Theorem.
- Verify Cauchy's theorem for the function $f(z) = z^2$ where c is the square having vertices $(0,0)$, $(1,0)$, $(1,1)$ & $(0,1)$
- Evaluate $\int e^z / (z + i\pi) dz$ over each of the following contours C , a) $|z| = 2\pi$, b) $|z| = \pi/2$, c) $|z - 1| = 1$
- Evaluate $\int e^{2z} / (z + 1)(z - 2) dz$ where c is the circle $|z| = 3$ using Residue Thm.

**MODULE-4: PROBABILITY DISTRIBUTIONS AND JOINT PROBABILITY DISTRIBUTIONS**

- Find the mean & variance of Binomial distribution.
- The marks of 1000 students in an examination follows in a normal distribution with mean 70 & SD 5. Find the number of students whose marks will be i) less than 65 , ii) more than 75 & iii) between 65 & 75.
- The probability mass function of a variate X is

$X = x_i$	-2	-1	0	1	2	3
$p(x)$	0.1	K	0.2	2k	0.3	k
- Find i) The value of K, ii) $p(x \leq 0)$, iii) $p(x > 1)$ iv) $p(-2 < x \leq 1)$
- If 10% of the rivets produced by a machine are defective, find the probability that, out of 12 rivets chosen at random.
- S.T mean & standard deviation of exponential distribution are equal.
- In a test of 2000 electric bulbs, it was found that the life of a bulb is a normal variable with average life of 2040 hours & standard deviation of 60 hours. Estimate the number of bulbs to burn for i) More than 2150 hours , ii) less than 1950 hours , Given that $p[0 \leq z \leq 1.83] = 0.4664$ & $p[0 \leq z \leq 1.33] = 0.4082$.
- 2% of the fusion manufactured by a firm are found to be defective .Find the probability that a box containing 200 fuses contains i) no defective fuse , ii) 3 or more defective fuses.
- In length of a telephone conversation is an exponential variate with mean 3 minutes. Find the probability that call i) ends in less than 3 minutes , ii) takes between 3 to 5 minutes.
- Suppose that the student IQ scores form a normal distribution with average 100 & standard deviation 20. Find the percentage of students whose (i) score less than 80 (ii) score more than 120 (iii) score falls between 80 & 120 ($G T P(1)=0.3413$)
- In a certain town the duration of a shower is exponentially distributed with mean 5 minutes what is the probability that a shower will last for i) 10 minutes or more, ii) less than 10 minutes, iii) betn 10 min & 12 min
- The joint probability distribution for two random variables X and Y is as given below.

Y	-2	-1	4	5	
X	1	0.1	0.2	0	0.3
	2	0.2	0.1	0.1	0

Find the marginal distributions of X, Y. Also find the covariance of X and Y.

- The Joint probability distribution of two random variables X and Y is as follows

Y	-4	2	7	
X	1	1/8	1/4	1/8
	5	1/4	1/8	1/8

- Determine (i) Marginal distribution of X & Y (ii) $E(X)$, $E(Y)$ and $E(XY)$ (iii) $Cov(XY)$ (iv) $\rho(XY)$.
- A fair coin is tossed 4 times. Let X denotes the number of heads occurring and let Y denotes the longest string of heads occurring. Find the joint distribution function of X and Y.

MODULE-5: SAMPLING THEORY AND STOCHASTIC PROCESS

- Explain the following terms i) Null hypothesis , ii) Level of significance , iii) Type I & II errors , iv) Confidence limits.
- A sample of 100 days is taken from meteorological records of certain districts & 10 of them are found to be fussy. Find the 99.73 % confidence interval of the % of fussy days in the district.
- A certain stimulus administered to each of the 12 patients resulted in the following blood pressure 5,2,8,-1,3,0,6,-2,1,5,0,4, can it be calculated that stimulus will increase the blood pressure ?



[t 0.05 for 11d.f= 2.201]

- A die was thrown 9000 times & a throw of 5 or 6 was obtained 3240 times. On the assumption of random throwing, do the data abdicate that the die is biased?
- A random sample of 100 records deaths in past year showed an average life span of 71.8 years. Assuming a population standard deviation of 8.9 years, does the data indicated that average life span today is greater than 70 years? Use a 0.05 level of significance.
- In 324 throws of a six faced die, an odd number turned up 181 times. Is it reasonable to think that the die is an unbiased one?
- Four coins are tossed 100 times & the following results were obtained

No. of Heads	0	1	2	3	4
Frequencies	5	29	36	25	5

Fit a Binomial distribution for the data & test the goodness of fit given

$$\chi^2_{0.05} = 9.49 \text{ for } 4 \text{ d. f}$$

- Find the student's 't' for the following variable values in a sample of eight -4,-2,-2,0,2,2,3,3 taking the mean of the universe to be zero.
- A coin was tossed 400 times & the head turned up 216 times. Test the hypotheses that the coin is in biased at 5% level significance.
- A die was thrown 1200 times & the number 6 was obtained 236 times. Can the die be considered fair at level of significance?
- Explain i) Random sample ii) Sample mean iii) Population mean
- Find the fixed probability vector of the regular stochastic matrix $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1/2 & 1/2 & 0 \end{bmatrix}$
- Explain i) Transient state ii) Recurrent state iii) absorbing state of Markov chain
- Each year a man trades his car for a new car in 3 brands of the popular company Maruti Udyuog Limited. If he has a 'standard' he trades it for 'zen'. If he has a 'zen' he trades it for a 'Esteem'. If he has a 'Esteem' is just as likely to trade it for a new 'Esteem' or for a 'zen' or a 'standard'. In 1996 he bought his first car which was 'Esteem'. Find the probability that he has (i) 1999 Esteem (ii)1998 Standard (iii)1999 Zen
- Define stochastic matrix. Find the unique fixed probability vector for the regular stochastic matrix

$$\begin{bmatrix} 0 & 1 & 0 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/4 & 1/4 \end{bmatrix}$$

- Find the fixed probability vector of the regular stochastic matrix $A = \begin{bmatrix} 0.5 & 0.25 & 0.25 \\ 0.5 & 0 & 0.5 \\ 0 & 1 & 0 \end{bmatrix}$

16.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by	Checked by		



Prof. S. A. Patil	Prof. S. L. Patil	HOD	Principal
Subject Title		OBJECT ORIENTED CONCEPTS	
Subject Code	17CS42	IA Marks	40
Number of Lecture Hrs / Week	03L/Week	Exam Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
CREDITS-03			

FACULTY DETAILS:**Name:** Prof. S V Manjaragi**Designation:** Asst. Professor**Experience:** 14.5**No. of times course taught:** 03**Specialization:** Computer Science & Engineering**1.0 Prerequisite Subjects:**

Sl. No	Branch	Semester	Subject
01	Computer Science and Engineering	I	Programming in C & Data Structures

2.0 Course Objectives

This course will enable students to

1. Learn fundamental features of object oriented language and JAVA.
2. Set up Java JDK environment to create, debug and run simple Java programs.
3. Create multi-threaded programs and event handling mechanisms.
4. Introduce event driven Graphical User Interface (GUI) programming using applets and swings..

3.0 Course Outcomes

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

	Course Outcome	RBT Level	POs/PSOs
C211.1	Explain concepts of object oriented programming with C++.	L2	PO1, PO2, PO3, PO5, PO8, PO10, PO12, PSO1, PSO2
C211.2	Develop Java programs to solve problems.	L3	PO1, PO2, PO3, PO5, PO8, PO10, PO12, PSO1, PSO2
C211.3	Explain Inheritance, Exceptions, Packages and Interfaces in Java.	L2	PO1, PO2, PO3, PO5, PO8, PO10, PO12, PSO1, PSO2
C211.4	Develop multithreaded programs.	L3	PO1, PO2, PO3, PO5, PO8, PO10, PO12, PSO1, PSO2
C211.5	Develop simple event based Graphical User Interfaces using Applets and Swings.	L3	PO1, PO2, PO3, PO5, PO8, PO10, PO12, PSO1, PSO2
Total Hours of instruction			40

**4.0****Course Content****Module – 1****08 Hours****Introduction to Object Oriented Concepts:**

A Review of structures, Procedure–Oriented Programming system, Object Oriented Programming System, Comparison of Object Oriented Language with C, Console I/O, variables and reference variables, Function Prototyping, Function Overloading. **Class and Objects:** Introduction, member functions and data, objects and functions, objects and arrays, Namespaces, Nested classes, Constructors, Destructors.

Text book 1: Ch 1: 1.1 to 1.9 Ch 2: 2.1 to 2.6 Ch 4: 4.1 to 4.2**Module -2****08 Hours**

Introduction to Java: Java's magic: the Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements.

Text book 2: Ch:1 Ch: 2 Ch:3 Ch:4 Ch:5**Module- 3****08 Hours**

Classes, Inheritance, Exceptions, Packages and Interfaces: Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. Inheritance: inheritance basics, using super, creating multi level hierarchy, method overriding. Exception handling: Exception handling in Java. Packages, Access Protection, Importing Packages, Interfaces.

Text book 2: Ch:6 Ch: 8 Ch:9 Ch:10**Module- 4****08 Hours**

Multi Threaded Programming, Event Handling: Multi Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, readwrite problem, producer consumer problems. Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes.

Text book 2: Ch 11: Ch: 22**Module -5****08 Hours**

The Applet Class: Introduction, Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface;Output to the Console. **Swings:** Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; JLabel and ImageIcon; JTextField;The Swing Buttons; JTabbedPane; JScrollPane; JList; JComboBox; JTable.

Text book 2: Ch 21: Ch: 29 Ch: 30**5.0****Relevance to future subjects**

Sl No	Semester	Subject	Topics
01	IV	Design & analysis of Algorithms Lab	Implementation of various algorithms using Java.
02	V	Advanced Java & J2EE	Java Enumerations, Collection Framework, JDBC, Servlets, JSP
03	VII	Web Programming	Java Script
04	VIII	Project work	Implementation of the projects using Java.

6.0**Relevance to Real World**

SL.No	Real World Mapping
01	Designing commercial e-commerce website, android applications
02	Developing scientific application and financial applications like electronic trading systems.
03	Developing Software tools such as Eclipse, InetelliJ Idea and Netbeans IDE.

**7.0 Gap Analysis and Mitigation**

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Module I-Module V
02	NPTEL	Applets Programming Videos

8.0 Books Used and Recommended to Students

Text Books
<ol style="list-style-type: none"> Sourav Sahay, Object Oriented Programming with C++ , 2nd Ed, Oxford University Press,2006 (Chapters 1, 2, 4) Herbert Schildt, Java the Complete Reference, 7th Edition, Tata McGraw Hill, 2007. (Chapters 1, 2, 3, 4, 5, 6, 8, 9,10, 11, 21, 22, 29, 30)
Reference Books
<ol style="list-style-type: none"> Mahesh Bhawe and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806 Herbert Schildt, The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003. Stanley B.Lippmann, Josee Lajore, C++ Primer, 4th Edition, Pearson Education, 2005. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited. Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.
Additional Study material & e-Books
<ol style="list-style-type: none"> https://docs.oracle.com/javase/tutorial/ http://javabeginnerstutorial.com/core-java http://onlinevideolecture.com/ebooks/?subject=Java https://www.youtube.com/playlist?list=PLS1QulWo1RlbfTjQvTdj8Y6yyq4R7g-AI www.codejava.net/books/4-best-free-java-e-books-for-beginners

9.0 Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References
<ol style="list-style-type: none"> www.nptelvideos.com/java/java_video_lectures_tutorials.php https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html www.nptel.ac.in/courses/106105084/28

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Java Magazine - Oracle	www.oracle.com/technetwork/java/javamagazine/
2.	Java - IEEE Conferences, Publications, and Resources	https://www.computer.org/software-magazine/
3.	Java Developer's Journal - Steven Gould	https://jsrd.springeropen.com/

11.0 Examination Note**Internal Assessment: 20+10=30 Marks**

30 Marks: Internal Assessment test

10 Marks: Assignments

**Scheme of Evaluation for Internal Assessment (30 Marks)**

- Internal Assessment test in the same pattern as that of the main examination (Avg. of three Tests): 30 marks.
- Class work (Assignment writing on all modules) : 10 Marks.

SCHEME OF EXAMINATION:

Two main questions to be set from syllabus covered up to IA tests. Student must answer two full main questions and each question is for 15 Marks.

Q.No-I or Q.No-II	= 15 Marks
Q.No-III or Q.No-IV	= 15 Marks
Total	= 30 Marks

Average of three IA's will be added with assignment marks and final evaluation will be done for 40 marks.

INSTRUCTIONS FOR OBJECT ORIENTED CONCEPTS (17CS42) EXAMINATION

- Total Examination Duration : 3 hours
- Total 10 questions in main examination and each module is covered by two full main questions.
- Total marks of Object Oriented Concepts paper is 100 marks and each question is of 20 marks. (Marks scored out of 100 will be reduced out of 60).

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
PART - A			
MODULE 1	1.	A Review of structures, Procedure–Oriented Programming system	20%
	2.	Object Oriented Programming System, Comparison of Object Oriented Language with C	
	3.	Console I/O, variables and reference variables	
	4.	Function Prototyping, Function Overloading	
	5.	Class and Objects: Introduction	
	6.	Member functions and data, objects and functions	
	7.	objects and arrays, Namespaces	
	8.	Nested classes, Constructors, Destructors	
MODULE 2	9.	Introduction to Java: Java's magic: the Byte code	20%
	10.	Java Development Kit (JDK)	
	11.	Java Buzzwords	
	12.	Object-oriented programming; Simple Java programs	
	13.	Data types	
	14.	Variables and arrays	
	15.	Operators, Control Statements	
	16.	Java Programs using Control Statements	
MODULE 3	17.	Classes: Classes fundamentals; Declaring objects	20%
	18.	Constructors, this keyword, garbage collection	
	19.	Inheritance: inheritance basics, using super	
	20.	Creating multi level hierarchy	
	21.	Method overriding	
	22.	Exception handling: Exception handling in Java	
	23.	Packages, Access Protection	
	24.	Importing Packages, Interfaces	
MODULE 4	25.	Multi Threaded Programming: What are threads? How to make the classes threadable?	20%
	26.	Extending threads; Implementing runnable	
	27.	Synchronization; Changing state of the thread	
	28.	Bounded buffer problems	
	29.	Read-write problem, producer consumer problems.	



MODULE 5	30.	Event Handling: Two event handling mechanisms; The delegation event model;	20%
	31.	Event classes; Sources of events, Event listener interfaces;	
	32.	Using the delegation event model;	
	33.	Adapter classes	
	34.	Inner classes	
	35.	The Applet Class: Introduction, Two types of Applets	
	36.	Applet basics; Applet Architecture; An Applet skeleton	
	37.	Simple Applet display methods; Requesting repainting; Using the Status Window	
	38.	The HTML APPLET tag; Passing parameters to Applets	
	39.	getDocumentbase() and getCodebase(), ApletContext and showDocument() The AudioClip Interface; The AppletStub Interface; Output to the Console	
	40.	Swings: Swings: The origins of Swing; Two key Swing features; Components and Containers, The Swing Packages;	
	41.	A simple Swing Application, Create a Swing Applet; JLabel and ImageIcon;	
	42.	JTextField; The Swing Buttons; JTabbedPane; JScrollPane; JList; JComboBox; JTable.	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on introduction and requirements engineering	Students study the Topics and write the Answers. Get practice to solve university questions.	Module I of the syllabus	2	Individual Activity. Printed solution expected.	Book 1 of the reference list. Website of the Reference list
2	Assignment 2: University Questions on system models, design and implementation	Students study the Topics and write the Answers. Get practice to solve university questions.	Module II of the syllabus	4	Individual Activity. Printed solution expected.	Book 1 of the reference list. Website of the Reference list
3	Assignment 3: University Questions on software testing and evolution	Students study the Topics and write the Answers. Get practice to solve university questions.	Module III of the syllabus	6	Individual Activity. Printed solution expected.	Book 1 of the reference list. Website of the Reference list
4	Assignment 4: University Questions on project planning and quality management	Students study the Topics and write the Answers. Get practice to solve university questions.	Module IV of the syllabus	8	Individual Activity. Printed solution expected.	Book 1 of the reference list. Website of the Reference list
5	Assignment 5: University Questions on Agile software development	Students study the Topics and write the Answers. Get practice to solve university questions.	Module V of the syllabus	10	Individual Activity. Printed solution expected.	Book 1 and SCRUM primer of the reference list. Website of the Reference list

**14.0****QUESTION BANK****Module: 1**

1. Compare Object Oriented Programming with C. Discuss three OOP principles.
2. Write the differences between procedure oriented program and object oriented program. (Jan-2019)
3. List and explain any four features of Object Oriented Program. (Jan-2019)
4. State the important features of Object Oriented programming paradigm. (July-2018)
5. List out the difference between procedure oriented program and object oriented program. (Jan-2018)
6. Explain function prototyping with example. (Jan-2018, July-2018)
7. Explain function overloading with example. (Jan-2018)
8. What is function overloading? Write a C++ program to define three overloaded functions to find the sum of two integers, sum of two floating numbers and sum of three integers. (Jan-2019)
9. Explain the concepts of Objects, Classes with suitable examples.
10. Define a Student class with following measures: (Jan-2019)
Data members: RollNo, Name, average marks
Member functions: to read data, to print data, write a C++ program to read data of 10 students and print the 10 students information.
11. Discuss objects and arrays with suitable examples.
12. What are constructors and destructors? Explain with a C++ program.
13. Explain namespace, with an example. (July-2018)
14. How do namespace help in preventing pollution of the global name space? (Jan-2018)
15. With an example explain Nested Classes.
16. How do name space helps in preventing pollution of the global namespace. (July-2017)
17. What is function polymorphism? Write a program in C++ using overloaded function to find area of circle, triangle, and rectangle. (July-2017)
18. Define a friend function. Illustrate with an example. (Jan-2019)
19. Explain how one can bridge two classes using friend function. Write a C++ program to find the sum of two numbers using bridge friend function add(). (July-2017)
20. What is constructor? Mention it's types. Explain parameterized constructor with an example. (Jan-2019)
21. Can you overload constructor and destructor justify with suitable program. (July-2017)
22. What is constructor? List the different type of constructors and explain default constructor with example.
23. What is the reference variable? Explain. Also write a program in C++ to swap two int values and display the values before and after swapping. (July-2017)
24. What are static member of a class? Write a C++ program to count the number of objects created. (July-2017)
25. Explain the concept of object oriented program i) Encapsulation ii) Polymorphism iii) Inheritance iv) Data initialization.
26. Write a C++ program to get employees details (empno, ename, bsalary(initialized to 1000 by constructor) and allowance) of Employee class through keyboard using the method Getdata() and display them using the method Dispdata() on console in the format empno,ename , bsalary, allowance. (July-2018)
27. Define Function Overloading and write a C++ program for finding areas of circle ($\pi * r * r$), rectangle ($l * b$) and square ($x * x$) by getting r, l, b and x through keyboard and printing the areas on console using the method Area() applying the concept of function overloading. (July-2018)

Module: 2

1. Briefly explain any six key considerations used for designing JAVA language. (Dec.10)
2. Explain how java is robust and interactive. (Jan-2018)
3. State the features used in C++ which are eliminated in Java. Why?
4. How "compile once and run anywhere" is implemented in Java. Discuss. (Dec.10, Jun-14, July-2017)
5. Discuss briefly the concept of byte code in Java.(July-2018)
6. Define bytecode. How does it help java programs achieve portability? (Jan-2019)
7. Explain the features of Java.(May/June.10)
8. Elucidate how Java is a platform independent language, with neat sketches. (July-2018)
9. List and explain Java buzzwords. (Dec.09/Jan.10, Jun-14, July-2017, Jan-2019)
10. Explain the process of creating and running Java programs.(July-2018)
11. Write a Java program to print factorial of the number 'n' using for loop. (July-2018)
12. Explain the structure of a Java program and its keywords with an example. (July-2018)
13. Write a program to calculate the average among the elements {8, 6, 2, 7} using for each in Java. How for each is different from for loop? (July-2017)



14. Write a Java program to sum only the first five elements of the array {1,2,3,4,5,6,7,8,9,10} using for each version of the for loop.
15. Write java program to sum only first five elements of the array using for each looping. (Jan-2018)
16. Explain the operation of the following operators with example. (Jan-2018)
 - i) % ii) >>> iii) &&
17. Write & demonstrate a Java program to initialize & display different types of integers & floating type variable. (Dec-14)
18. Write java program to initialize and display different types of integer and floating point variables. (Jan-2018)
19. Explain different access specifiers in Java & their scope. (Dec.09, Dec-14)
20. Define type casting. Explain with an example. (Dec-14, Jan-2019)
21. Explain type conversion, with an example. (July-2017)
22. What is type casting? Illustrate with an example. What is meant by automatic type promotion? (Jan-2018)
23. How arrays are defined in Java? Explain with an example. (Dec-11, Jun-13 Dec-14)
24. Explain the concepts of arrays in Java with examples. Also write a program that creates and initializes a four integer elements array. Find the sum and average of its values. (July-2017)
25. How arrays are defined in Java? Explain with an example. (July-2018)
26. How to declare two dimensional arrays in java? Explain with simple example. (Jan-2018)
27. Write a Java program to illustrate the use of multidimensional arrays.
28. Discuss operators in Java. (Dec.10)
29. Write a note on object instantiation. (Dec.09/Jan.10)
30. What is jump statement? Explain with examples. (Dec-12, Jun-13)
31. Explain : i) >>> ii) short circuit logical operators iii) for each (Jun-14)
32. With an example explain the working of >> and >>> (unsigned right shift) (Jan-2019)
33. Describe the process of building & running Java program. (Jun-14)

Module- 3

1. What is command-line argument? Write a program to demonstrate command-line arguments. (Jun-13)
2. What are the different types of inner classes? Write a program to demonstrate inner class. (Dec.10) (May/June.10)
3. WAP in JAVA to implement stack that can hold 10 integer values. (Dec-12)
4. Differentiate C++ language and Java language with respect to inheritance, and also mention the use of super and this in Java Inheritance. (Dec.10)
5. Define inheritance. List the different types of inheritance. (Jan-2018)
6. Discuss the following terms with an example: i) super ii) final (Jan-2019)
7. Define inheritance. Explain the multilevel hierarchy with an example program, (Jan-2019)
8. Elucidate the concept of inheritance and its classifications in Java with sketches. (July-2018)
9. With an example, give two uses of super keyword? (July-2017)
10. Illustrate with example a super class variable can reference a subclass object. (Jan-2018)
11. Explain package and its types and import command in Java with examples. (July-2018)
12. Describe the various levels of access protections available for packages and their implications. (Jan-2018, Jan-2019)
13. Which is the alternative method to implement multiple inheritance in Java? Explain with an example. (Dec.09/Jan.10)
14. Explain the role of interfaces while implementing multiple inheritance in Java. (Dec.10, July-2017)
15. Write a Java program to define an interface called Area which contains method called Compute() and calculate the areas of rectangle ($l * b$) and triangle ($1/2 * b * h$) using classes Rectangle and Triangle. (July-18)
16. With an example program explain the method overriding? (Dec.10)
17. Compare and contrast method overloading and method overriding with suitable examples. (July-2017, Jan-18)
18. When constructors are called in the class hierarchy? (July-2017)
19. Distinguish between method overloading and overriding in Java, with suitable example. (Jan-2019)
20. Why overridden methods are used in Java? Explain with an example. (Jun-13)
21. Give the basic form of an exception handling block. (Jan-2018)
22. Define the role of Exception handling in software development. (July-2018)
23. What is an exception? Give an example for nested try statements. (Dec-12)
24. Define exception. Explain the exception handling mechanism with an example. (Jan-2019)
25. Explain Java's built-in exceptions. (June-10)
26. What is the importance of the clause finally? (Jan-2018)
27. Create a try block that is likely to generate three types of exception and incorporate necessary catch block to catch and handle them. (Dec.09)



28. Write a Java program for illustrating the exception handling when a number is divided by zero and an array has a negative index value. (July-2018)

Module- 4

1. What are threads? Provide any two typical applications where multithreaded programming is used. (Dec.10)
2. Define the concept of multithreading in Java and explain the different phases in the life cycle of a thread, with a neat sketch. (July-2018)
3. With an example program show the Thread creation.
4. What is Thread? Explain two ways of creation of thread. (Jan-2018, Jan-2019)
5. Demonstrate creating multiple threads.
6. Write a Java program, which creates two threads, one thread displays "VTU-Belgaum" for every 100 seconds, and another thread displays "Karnataka" for every 50 sec's, continuously. (Dec.10)
7. What is meant by Thread Priority? How to assign & get thread priority? (Dec.09, Jun-13 Dec-14)
8. With syntax explain the use of isAlive() and join() methods. (Jan-2019)
9. Discuss briefly Synchronization in Java (2). (July-2018)
10. What is synchronization? When do we use it? (Jan-2018)
11. Write an example Program for implementing static synchronization in Java. (July-2018)
12. Elucidate the two ways of making a class threadable, with examples. (July-2018)
13. What is need of synchronization? Explain with an example, how synchronization is implemented in Java? (Dec.09, Jun-14, Jun-15, Jan-19)
14. What is synchronization? What is the role of synchronization in threads? Demonstrate a program using synchronized methods. (Jun.10)
15. How do I serialize an object to a file?
16. What is multithreaded programming? Explain with an example hoe inter thread communication is implemented in Java. (Jun-13)
17. What is producer – consumer problem? Explain the solution for producer-consumer problem with a program. (Jun.10, Jun-14)
18. What is synchronization? Explain the role of synchronization with producer & consumer problem. (Dec-14)
19. Why is the "main" thread important? Write a Java program that creates multiple child threads & also ensures that the main thread is last to stop. (Jun-15)
20. Describe the delegation event model and explain what happens internally at a button click. (July-2018)
21. Explain delegation event model used to handle events in Java. What are events, event listeners and event sources? (Jan-2019)
22. What are the two event handling mechanisms in Java?
23. Explain Delegation event model used to handle events in java. (Jan-208)
24. Explain the delegation event model used to handle events in Java. What are events, event listeners & event sources? (Dec.10, Jun-15)
25. What are the Event classes? (Dec.10)
26. Explain keyEvents and mouseEvent class. (Jan-2018)
27. Write a Java program to handle mouse and keyboard events.
28. Explain Adapter classes, with examples. (Dec.09, Jun.10)
29. Explain Adapter class and Inner class with example. (Jan-2019)
30. Write a note on event listener interfaces. (Jun-13)
31. Explain any two event listener interfaces with its functions or methods. (Dec-14)
32. Briefly explain the role of: i) ActionEvent class ii) AdjustmentEvent class (Dec-12)
33. What is delegation event model? Describe the significance of adapter class, with an example. (Jun-14)
34. Explain the role of synchronization with producer and consumer problem. (Jan-2018)

Module -5

1. Briefly explain Applets. (July-2018)
2. What is an Applet? Discuss Applet life cycle. (Dec.09, Dec-14 Jun-15)
3. Elucidate lucidly the skeleton of an Applet. (July-2018)
4. What is an Applet? Explain the skeleton of an Applet. Enlist Applet tags. (Jan-2019)
5. What is an applet? Explain five main methods of applet. (Jan-2018)
6. Explain Applet architecture and demonstrate how to pass parameters for font size, font name, and type conversions in applets. (May/June.10, Jun-13)
7. Write a Java applet which continuously plays an audio clip named "anthem.wav" loaded from applet parent directory. Provide necessary HTML file to run this applet. (Dec.10)
8. List Applet initialization and termination methods. Write a Java applet that sets the background color to Cyan and foreground color to red & outputs a string "A Simple Applet". (Dec-12)



9. Describe the significance of final & super, with examples. (Jun-14)
10. What is an exception? Explain the different exception handling mechanisms, with an example. (Jun-14)
11. Write an applet program to display the message "VTU BELGAUM". Set the background color to cyan & foreground color to red. (Jun-14)
12. Write a program using an Applet which will print "Key Pressed" on the status window, "Key Released" on the status window when you release the key and when you type the characters it should print "Hello" at coordinates (50, 50) on Applet. (Jan-2019)
13. Write a Java program to play an audio file using Applet. (July-2018)
14. Write the syntax of try & catch block to handle multiple exceptions, explain. (Dec-14)
15. Write a Java program to perform addition of two complex numbers by using add() method by passing object as parameter & display the result using display() method. Initialize the real & imaginary values by using parameter constructor. (Dec-14)
16. Explain with an example each, the effect of the keyword "final" with a I) class ii) methods of a class. (Jun-15)
17. Differentiate between AWT and Swings. (Dec-12)
18. Describe the key feature of swings. (Jan-2019)
19. Write the advantages of swing over AWT. (July-2018)
20. What are Swings? Provide any two typical applications of swings. (Dec.10)
21. Explain MVC architecture of Swings.(Dec-12)
22. What are the deficiencies of AWT that are overcome by Swings? Explain the two key features of swings. (Jun-15)
23. Create a simple swing Application.
24. Explain the various components of swing package. (Dec.10)
25. Briefly explain the containers and components in swings. (Jun.10, Jun-13)
26. Explain JLabel, JTabbedPane, JScrollPane, JComboBox. (Dec.10, Jun.10)
27. Explain JScrollPane with an example. (Dec-14)
28. Explain JComboBox with an example. (Dec-14)
29. Explain with syntax the following : I) JLabel ii) JTextField iii) JButton iv) JCheckBox (Jun-15, Jan-18/19)
30. Describe the different types of Swing buttons. (Dec-12)
31. Explain getDocumentbase and getCodebase in applet class. (Jan-2018)
32. Create a swing applet that has two buttons named alpha and beta. When either of the buttons pressed, it should display "alpha was pressed" and "beta was pressed", respectively. (Dec.09, Jun-14, Jan-2018)
33. Name and explain the different types of swing buttons. Give their syntax. (Dec.09)
34. Write the steps to create JTable. Write a program to create a table with the column headings "Fname, Lname, Age" and insert at least 5 records in the table and display. (Dec.09, Jun-13)
35. Write a Java swing applet , which accepts a text from JText field and display the same text with selected font size and color using JLabel. (Dec.10)
36. What is swing? List the main swing features. Explain the different types of panes of swing containers. (Jun-14).
37. List the different types of swing buttons. Write a program to create four types of buttons on JApplet. Use suitable events to show actions on the buttons & use JLabel to display the action invoked. (Jun -14)
38. Write a Swing applet program to demonstrate with two Jbuttons named India & Srilanka. When either of the buttons pressed, it should display respective label with its icon. Refer the image icons "India.gif" & "Srilanka.gif". Set the initial label is "press a button". (Dec-14)
39. Write a swing program for displaying anyone of the options. C , C++ , Java, Php through the selection of Combo box by clicking show button. (July-2018)

15.0**University Result**

Examination	S+	S	A	B	C	D	E	% Passing
NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by	Checked by		
Prof. S V Manjaragi	Dr. P. C. Baraki	HOD	Principal



Subject Title	DESIGN AND ANALYSIS OF ALGORITHMS		
Subject Code	17CS43	IA Marks	40
Number of Lecture Hrs / Week	04	Exam Marks	60
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 04			

FACULTY DETAILS:			
Name: Mr. C. R. Belavi	Designation: Asst. Professor	Experience: 10.6 years	
No. of times course taught: 01	Specialization: Computer Science and Engineering		

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science and Engineering	I/II	PCD
02	Computer Science and Engineering	III	DSC

2.0 Course Objectives

This course will enable students to

1. Explain various computational problem solving techniques.
2. Apply appropriate method to solve a given problem.
3. Describe various methods of algorithm analysis.

3.0 Course Outcomes

After studying this course, students will be able to

CO	Course Outcome	Cognitive Level	POs/PSOs
C212.1	Explain the specifications of algorithms, fundamental data structures and their operations.	L2	PO1,PO2,PO3,PO6, PO8.PO10,PO12
C212.2	Explain various searching problem solving techniques.	L2	PO1,PO2,PO3,PO6, PO8.PO10,PO12
C212.3	Explain various sorting problem solving techniques.	L2	PO1,PO2,PO3,PO6, PO8.PO10,PO12
C212.4	Estimate the computational complexity of different algorithms.	L5	PO1,PO2,PO3,PO6, PO8.PO10,PO12
C212.5	Choose appropriate algorithmic strategies for problem solving.	L3	PO1,PO2,PO3,PO6, PO8.PO10,PO12
Total Hours of instruction			50

4.0 Course Content

Module 1

(10 Hours)

Introduction: What is an Algorithm? (T2:1.1), Algorithm Specification (T2:1.2), Analysis Framework (T1:2.1), **Performance Analysis:** Space complexity, Timecomplexity (T2:1.3). **Asymptotic Notations:** Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), **Mathematical analysis of Non-Recursive and recursive Algorithms with Examples (T1:2.2, 2.3, 2.4).** **Important Problem Types:** Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. **Fundamental Data Structures:** Stacks, Queues, Graphs, Trees, Sets and Dictionaries. (T1:1.3,1.4)

Module 2

(10 Hours)

Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the



maximum and minimum (T2:3.1, 3.3, 3.4), Merge sort, Quick sort (T1:4.1, 4.2), Strassen's matrix multiplication (T2:3.8), Advantages and Disadvantages of divide and conquer. Decrease and Conquer Approach: Topological Sort. (T1:5.3)

Module 3 (10 Hours)

Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines (T2:4.1, 4. (10 Hours)3, 4.5). **Minimum cost spanning trees:** Prim's Algorithm, Kruskal's Algorithm (T1:9.1, 9.2). **Single source shortest paths:** Dijkstra's Algorithm (T1:9.3). **Optimal Tree problem:** Huffman Trees and Codes (T1:9.4). **Transform and Conquer Approach:** Heaps and Heap Sort (T1:6.4).

Module 4 (10 Hours)

Dynamic Programming: General method with Examples, Multistage Graphs (T2:5.1, 5.2). **Transitive Closure:** Warshall's Algorithm, **All Pairs Shortest Paths:** Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem ((T1:8.2, 8.3, 8.4), Bellman-Ford Algorithm (T2:5.4), Travelling Sales Person problem (T2:5.9), Reliability design (T2:5.8).

Module 5 (10 Hours)

Backtracking: General method (T2:7.1), N-Queens problem (T1:12.1), Sum of subsets problem (T1:12.1), Graph coloring (T2:7.4), Hamiltonian cycles (T2:7.5). **Branch and Bound:** Assignment Problem, Travelling Sales Person problem (T1:12.2), **0/1 Knapsack problem (T2:8.2, T1:12.2):** LC Branch and Bound solution (T2:8.2), FIFO Branch and Bound solution (T2:8.2). **NP-Complete and NP-Hard problems:** Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes (T2:11.1).

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Design, Develop and Analysis

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Design and analysis of algorithms for a problem
02	Development of a software applications

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Different Algorithms' Discussion for some problems
02	NPTEL	Software Applications

8.0 Books Used and Recommended to Students

Text Books
1. Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2 nd Edition, 2009.Pearson
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2 nd Edition, 2014, Universities Press
Reference Books
1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI
2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education)
Additional Study material & e-Books
1. Lecture Notes for Algorithm Analysis and Design by Sandeep Sen
2. Introduction to the Design and Analysis of Algorithms by K. Raghava Rao

**9.0****Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended****Website and Internet Contents References**

1. <http://freecomputerbooks.com/Introduction-to-Design-Analysis-of-Algorithms.html>
2. [http://www.freebookcentre.net/ComputerScience-Books-Download/Lecture-Notes-for-Algorithm-Analysis-and-Design-\(PDF-124P\).html](http://www.freebookcentre.net/ComputerScience-Books-Download/Lecture-Notes-for-Algorithm-Analysis-and-Design-(PDF-124P).html)
3. <http://www.e-booksdirectory.com/details.php?ebook=9498>

10.0**Magazines/Journals Used and Recommended to Students**

Sl. No	Magazines/Journals	website
1	Journal of Discrete Algorithms	https://www.journals.elsevier.com/journal-of-discrete-algorithms/
2	American Journal of Algorithms and Computing	http://ajac.uscip.us/
3	International Journal of Computing Algorithm (IJCOA)	https://www.ijcoa.com/
4	International Journal of Algorithms Design and Analysis	http://journalspub.com/journalspub/JournalsDetails.aspx?jid=109

11.0**Examination Note****Internal Assessment: 30+10=40 Marks**

30 marks –from three internal assessment test

10 marks- from the assignments

Scheme of Evaluation for Internal Assessment (30 Marks)

- a) Internal Assessment test in the same pattern as that of the main examination (Average of the three Tests): 30marks.
- b) Assignment marks for each module is 25. Average of 5 assignment marks will be taken and finally scale down to 10 marks.

Question Paper Pattern (IA):

1. Two main questions to be set from syllabus covered up to IA tests.
2. Student has to answer two full main questions and each question carries 15 marks, Total test marks are 30.
 - a. Q.No I or Q.No II = 15 Marks
 - b. Q.No III or Q.No IV = 15 Marks
 - c. **Total = 30 Marks**

Question Paper Pattern and instructions (Main Exam):

1. The question paper will have TEN questions.
2. There will be TWO questions from each module.
3. Each question will have questions covering all the topics under a module.
4. The students will have to answer FIVE full questions, selecting ONE full question from each module.

Max. Marks: 100 and each question carries 20 marks.

Exam Duration: 3 Hrs.

5. The total marks scored out of 100 marks will be scaled down to 60 marks.



12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	1	Introduction: What is an Algorithm? (T2:1.1), Algorithm Specification (T2:1.2), Analysis Framework (T1:2.1).	20
	2	Performance Analysis: Space complexity, Time complexity (T2:1.3).	
	3	Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and	
	4	Little-oh notation (o).	
	5	Mathematical analysis of Non-Recursive and recursive Algorithms with Examples (T1:2.2,	
	6	2.3, and 2.4).	
	7	Important Problem Types: Sorting, Searching, String processing, Graph Problems,	
	8	Combinatorial Problems.	
	9	Fundamental Data Structures: Stacks, Queues, Graphs, Trees, Sets and	
	10	Dictionaries.(T1:1.3,1.4)	
2	11	Divide and Conquer: General method.	20
	12	Binary search, Recurrence equation for divide and conquer.	
	13	Finding the maximum and minimum (T2:3.1, 3.3, and 3.4).	
	14		
	15		
	16	Merge sort, Quick sort (T1:4.1, 4.2).	
	17		
	18	Strassen's matrix multiplication (T2:3.8).	
	19	Advantages and Disadvantages of divide and conquer.	
	20	Decrease and Conquer Approach: Topological Sort. (T1:5.3)	
3	21	Greedy Method: General method.	20
	22	Coin Change Problem, Knapsack Problem, Job sequencing with deadlines (T2:4.1, 4.3, and	
	23	4.5).	
	24		
	25	Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm (T1:9.1, 9.2).	
	26		
	27	Single source shortest paths: Dijkstra's Algorithm (T1:9.3).	
	28	Optimal Tree problem: Huffman Trees and Codes (T1:9.4).	
	29	Transform and Conquer Approach: Heaps and Heap Sort (T1:6.4).	
	30		
4	31	Dynamic Programming: General method with Examples.	20
	32	Multistage Graphs (T2:5.1, 5.2)	
	33		
	34	Transitive Closure: Warshall's Algorithm	
	35	All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem	
	36	((T1:8.2, 8.3, 8.4).	
	37		
	38	Bellman-Ford Algorithm (T2:5.4)	
	39	Travelling Sales Person problem (T2:5.9)	
	40	Reliability design (T2:5.8).	
5	41	Backtracking: General method (T2:7.1).	20
	42	N-Queens problem (T1:12.1).	
	43	Sum of subsets problem (T1:12.1)	
	44	Graph coloring (T2:7.4)	
	45	Hamiltonian cycles (T2:7.5).	
	46	Branch and Bound: Assignment Problem, Travelling Sales Person problem (T1:12.2),	
	47	0/1 Knapsack problem (T2:8.2, T1:12.2)	
	48	LC Branch and Bound solution (T2:8.2), FIFO Branch and Bound solution (T2:8.2).	
	49	NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP,	
	50	NP-Complete, and NP-Hard classes (T2:11.1).	



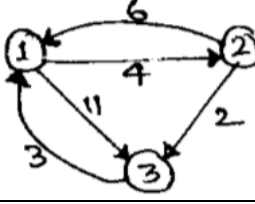
13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: Some important University Questions on Module one.	Students study the Topics and write the Answers. Get practice to solve questions	Module one of the syllabus	3	Individual Activity. Witten solutions expected.	Text book
2	Assignment 2: Some important University Questions on Module two	Students study the Topics and write the Answers. Get practice to solve questions	Module two of the syllabus	6	Individual Activity. Witten solutions expected.	Text book
3	Assignment 3: Some important University Questions on module three.	Students study the Topics and write the Answers. Get practice to solve questions	Module three of the syllabus	9	Individual Activity. Witten solutions expected.	Text book
4	Assignment 4: Some important University Questions on and comprehensive questions module four.	Students study the Topics and write the Answers. Get practice to solve questions	Module four of the syllabus	11	Group Activity power point presentation	Text book and reference books
5	Assignment 5: Some important University Questions on and comprehensive questions module five.	Students study the Topics and write the Answers. Get practice to solve questions	Module five of the syllabus	13	Group Activity power point presentation	Text book and reference books

14.0 Assignment Questions

Assignment No	Questions	Marks															
1	1. Explain the space and time efficiency.	5															
	2. Explain the asymptotic notations used for algorithm analysis.	5															
	3. Explain the Mathematical analysis of Non-Recursive and recursive Algorithms with Examples.	5															
	4. Define and explain the Stacks and Queues.	5															
2	1. Write and explain the Binary search algorithm.	5															
	2. Write the algorithm for Merge Sort and quick sort and also find the time efficiencies.	5															
	3. Advantages and Disadvantages of divide and conquer.	5															
	4. Solve topological sorting problem using DFS, explain with an example.	5															
3	1. Solve the following instance of Knapsack problem using branch and bound algorithm: <table border="1" style="margin-left: 40px;"> <tr> <td>Item</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Weight</td> <td>4</td> <td>7</td> <td>5</td> <td>3</td> </tr> <tr> <td>Value</td> <td>40</td> <td>42</td> <td>25</td> <td>12</td> </tr> </table> <p style="margin-left: 40px;">The capacity of the knapsack is W=10.</p>	Item	1	2	3	4	Weight	4	7	5	3	Value	40	42	25	12	5
Item	1	2	3	4													
Weight	4	7	5	3													
Value	40	42	25	12													



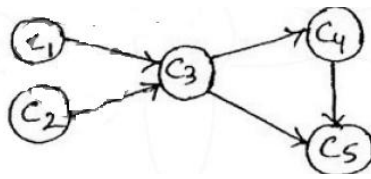
	2. What is job sequencing with deadline problem? Find the solution generated by job sequencing problem with deadlines for 7 jobs given profits 3,5,20,18,1,6,30 & deadlines 1,3,4,3,2,1,2 respectively.	5
	3. Define minimum cost spanning tree. Give the high level description of Prim's algorithm.	5
	4. Define Single source shortest path and Give the high level description Dijkstra's Algorithm.	5
4	1. Explain the Multistage Graphs	5
	2. Explain the Warshall's Algorithm	5
	3. Write Floyd's algorithm to solve all-pair-shortest-path problem, find the all-pair-shortest-path for given graph	5
		
	4. What do you mean by Reliability design? Explain	5
5	1. What is the central principle of backtracking? Taking n-queens problem as an example, explain the solution process.	5
	2. Write the pseudo code for backtracking algorithm. Draw the state-space tree for the sum of subset problem of the instance: $S = \{3, 5, 6, 7\}$ and $d=15$	5
	3. Differentiate between back tracking and Branch and bound algorithm.	5
	4. Explain in brief the non-deterministic algorithms with examples.	5

15.0**QUESTION BANK****Module 1: Introduction**

1. What is an Algorithm? What are the criteria that an algorithm must satisfy? [Dec-2018]
2. What is performance analysis? Explain time complexity and space complexity with the examples.
3. [July-2017]
4. With the help of a flowchart, explain the various steps of algorithm design & analysis process.
5. Define algorithm. Explain asymptotic notations used for algorithm analysis. [July-2017]
6. Given a positive decimal integer n , write a recursive algorithm which computes the number of binary digits in the binary representation of n . Write the corresponding recurrence relation and solve it
7. Mention the general plan for Analyzing time efficiency of non-recursive algorithms with example. [July-2017]
8. Mention the general plan for Analyzing time efficiency of recursive algorithms; and analyze and establish the order of growth of Tower of Hanoi algorithm. .[July-2017]
9. Define the fundamental data structures.
10. Write and analyze the algorithm of element uniqueness problem and establish its order of growth.
11. Explain the asymptotic notations with examples. [Dec-2018]
12. Distinguish between the two common ways to represent a graph. [Dec-2018]
13. Discuss about the important problem types and fundamental data structures. [Dec-2018]

Module 2: Divide and Conquer

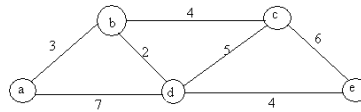
1. How do you apply divide-and-conquer technique for sorting? Write the algorithm for Merge Sort.[July-2017]
2. Write and briefly explain the recursive binary search algorithm.[July-2017]
3. Write Quick sort algorithm. Trace the same on data set 25, 10, 72, 18, 40, 11, 64, 58, 32, 9. [July-2017]
4. Write Quick sort algorithm. Trace the same on data set 65, 70, 75, 80, 85, 60, 55, 50, 45. [Dec-2018]
5. Explain the concept of divide and conquer. Design an algorithm for merge sort and derive its time complexity. [Dec-2018]
6. Briefly explain the Strassen's matrix multiplication. Obtain its time complexity. [Dec-2018]
7. Advantages and Disadvantages of divide and conquer. Illustrate the topological sorting for the following graph.



8. Write the merge sort algorithm and sort the list E, X, A, M, P, L, E in the alphabetical order using merge sort.

Module 3: Greedy Method

1. What is Greedy Technique? Write Prim's algorithm. [July-2017]
2. Sort the given list of numbers using heap sort. 2, 9, 7, 6, 5, 8. [July-2017]
3. Solve the following instance of the single source shortest path problem with vertex 'a' as the source. (Jan-2010, June/July 2015)



4. Explain the Dijkstra's algorithm to find single source shortest paths to other vertices. [July-2017]
5. Construct the Huffman tree and resulting code word for the following data and encode the word DAD and ADD [July-2017]

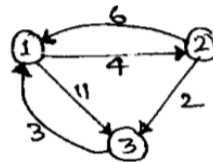
Character	A	B	C	D	_
Probabilities	0.35	0.1	0.2	0.2	0.15

Module 4: Dynamic Programming

1. Explain dynamic programming? [July-2017]
2. Apply Warshall's algorithm to find the transitive closure of the graph defined by the following adjacency matrix:

0	1	0	0
0	0	1	0
0	0	0	1
0	0	0	0

3. Write Floyd's algorithm to solve all-pair-shortest-path problem, find the all-pair-shortest-path for given graph



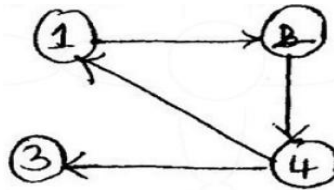
4. Draw the decision tree for the 3-elements insertion sort.
5. Apply Floyd's algorithm to solve the all-pairs shortest path problem for the graph whose weight matrix is given below:

0	2	∞	1	8
6	0	3	2	∞
∞	∞	0	4	∞
∞	∞	2	0	3
3	∞	∞	∞	0

6. Apply Floyd's algorithm to solve the all-pairs shortest path problem for the graph whose weight matrix is given below:

0	∞	3	∞
2	0	∞	∞
∞	7	0	1
6	∞	∞	0

7. Using Dynamic programming, solve the following knapsack instance:
N=3, [w1,w2,w3]=[1,2,3] and [p1,p2,p3]=[18,16,6] and M=4.
6. Write Warhsall's algorithm to find transitive closure.
7. Trace the following graph using Warshall's algorithm. [July-2017]



- Give the necessary recurrence relation used to solve 0/1 Knapsack problem using dynamic programming. Apply it to solve the following instance & show the results $n=4$ $m=5$ values 12,10,20,15 & weights are 2, 1, 3, 2 respectively. [July-2017]
- Explain multistage graphs. Write multistage algorithm to forward approach. [July-2017]

Module 5: Backtracking

- Explain back tracking technique. Illustrate N-queens problem using backtracking. [July-2017]
- Write the pseudo code for backtracking algorithm. Draw the state-space tree for the sum of subset problem of the instance: $S = \{5, 7, 8, \text{and } 10\}$ and $d=1$. (Jan-2010)
- Write the pseudo code for backtracking algorithm. Draw the state-space tree for the sum of subset problem of the instance: $S = \{3, 5, 6, 7\}$ and $d=15$. [July-2017]
- Explain Hamiltonian circuit problem.
- Solve the following instance of Knapsack problem using branch and bound algorithm:

Item	1	2	3	4
Weight	4	7	5	3
Value	40	42	25	12

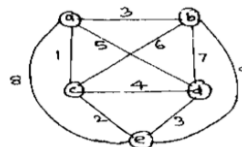
The capacity of the knapsack is $W=10$.

- Explain LC Branch and bound algorithm FIFO Branch and bound. [July-2017]
- What is branch and bound? How is it different from back tracking?
- Solve 8-queen problem for a feasible sequence (6, 4, 7, and 1).
- Explain how Traveling Salesman Problem can be solved by using Branch-and-Bound.
- Write and Explain Approximation Algorithm for the Knapsack Problem.
- For the given $n \times n$ matrix C for a job assignment problem find the optimal solution using branch & bound. Give complete state space tree for the instance of assignment problem solved with best first branch & bound algorithm. [July-2017]

C=

Job1	Job 2	Job 3	Job 4	
9	2	7	8	Person a
6	4	3	7	Person b
5	8	1	8	Person c
7	6	9	4	Person d

- With the help of state space tree, solve the traveling salesman problem of the given figure. Using branch-and- bound algorithm.



16.0 University Result

Examination	S+	S	A	B	C	D	E	F	% Passing
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by	Checked by		
Prof. C. R. Belavi	Dr. Parashuram Baraki	HOD	Principal



Subject Title	MICROPROCESSOR & MICROCONTROLLERS		
Subject Code	17CS44	IA Marks	40
Number of Lecture Hrs / Week	02 L+ 04 P	Exam Marks	60
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 04			

FACULTY DETAILS:

Name: Prof. N K Honnagoudar	Designation: Asst.Professor	Experience: 13
No. of times course taught: 01	Specialization: Digital Communication	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science engineering	III	Computer Organization

2.0 Course Objectives

This course will enable students to

1. Make familiar with importance and applications of microprocessors and microcontrollers
2. Expose architecture of 8086 microprocessor and ARM processor
3. Familiarize instruction set of ARM processor

3.0 Course Outcomes

Having successfully completed this course, the student will be able to

CO	Course Outcome	Cognitive Level	POs/PSo
C213.1	Differentiate between microprocessors and microcontrollers	L1	PO1,PO2,PO3, PO8,PO10,PO12, PSO1,PSO2
C213.2	Design and develop assembly language code to solve problems	L2	PO1,PO2,PO3, PO8,PO10,PO12, PSO1,PSO2
C213.3	Gain the knowledge for interfacing various devices to x86 family and ARM processor	L2	PO1,PO2,PO3, PO8,PO10,PO12, PSO1,PSO2
C213.4	Demonstrate design of interrupt routines for interfacing devices	L2	PO1,PO2,PO3, PO8,PO10,PO12, PSO1,PSO2
C213.5	Differentiate between data processing Instructions, Branch Instructions	L2	PO1,PO2,PO3, PO8,PO10,PO12, PSO1,PSO2

4.0 Course Content**Module-I****(10 Hours)**

The x86 microprocessor: Brief history of the x86 family, Inside the 8088/86, Introduction to assembly programming, Introduction to Program Segments, The Stack, Flag register, x86 Addressing Modes. **Assembly language programming:** Directives & a Sample Program, Assemble, Link & Run a program, More Sample programs, Control Transfer Instructions, Data Types and Data Definition, Full Segment Definition, Flowcharts and Pseudo code Text book 1: Ch 1: 1.1 to 1.7, Ch 2: 2.1 to 2.7

Module-II**(10 Hours)**

x86: Instructions sets description, **Arithmetic and logic instructions and programs:** Unsigned Addition and Subtraction, Unsigned Multiplication and Division, Logic Instructions, BCD and ASCII conversion, Rotate Instructions. **INT 21H and INT 10H Programming:** Bios INT 10H Programming, DOS Interrupt 21H. 8088/86 Interrupts, x86 PC and Interrupt



Assignment.

Text book 1: Ch 3: 3.1 to 3.5, Ch 4: 4.1 , 4.2 Chapter 14: 14.1 and 14.2

Module-III**(10 Hours)**

Signed Numbers and Strings: Signed number Arithmetic Operations, String operations. **Memory and Memory interfacing:** Memory address decoding, data integrity in RAM and ROM, 16 bit memory interfacing. **8255 I/O programming:** I/O addresses MAP of x86 PC's, programming and interfacing the 8255. Textbook 1: Ch6: 6.1, 6.2. Ch 10: 10.2, 10.4, 10.5. Ch 11: 11.1 to 11.4

Module-IV**(10 Hours)**

Microprocessor Versus Microcontrollers, **ARM Embedded Systems:** The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, **ARM Processor Fundamentals:** Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions
Textbook 2: Ch 1: 1.1 to 1.4, Ch 2: 2.1 to 2.5

Module-V**(10 Hours)**

Introduction to the ARM Instruction Set : Data Processing Instructions, Branch Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants, Simple programming exercises.
Textbook 2: Ch3: 3.1 to 3.6 (Excluding 3.5.2)

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Models

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Industrial applications, model creation for analysis.
02	Development of a software embedded applications

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	NPTEL	Microprocessor
02	NPTEL	ARM Processor.

8.0 Books Used and Recommended to Students

Text Books
1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Danny Causey, The x86 PC Assembly Language Design and Interfacing, 5th Edition, Pearson, 2013.
2. ARM System developers guide , Andrew N Sloss, Dominic Symes and Chris Wright, Elsevier, Morgan Kaufman publishers, 2008.
Reference Books
1. Douglas V. Hall: Microprocessors and Interfacing, Revised 2 nd Edition, TMH, 2006.
2. K. Udaya Kumar & B.S. Umashankar: Advanced Microprocessors & IBM-PC Assembly Language Programming, TMH 2003.
3. Ayala: The 8086 Microprocessor: programming and interfacing-1 st edition, Cengage Learning
4. The Definitive Guide to the ARM Cortex-M3, by Joseph Yiu, 2nd Edition, Newnes, 2009
5. The Insider's Guide to the ARM7 based microcontrollers, Hitex Ltd., 1 st edition, 2005
6. ARM System-on-Chip Architecture, Steve Furber, Second Edition, Pearson, 2015
7. Architecture, Programming and Interfacing of Low Power Processors-ARM7, Cortex-M and MSP430, Lyla B Das Cengage Learning, 1 st Edition
Additional Study material & e-Books

**9.0****Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended****Website and Internet Contents References**

NPTEL

10.0**Magazines/Journals Used and Recommended to Students**

Sl.No	Magazines/Journals	website
1	IEEE	http://ieeexplore.ieee.org
2	CSI	http://www.csi-india.org/

11.0**Examination Note****Internal Assessment: 20+10=30 Marks**

30 Marks: Internal Assessment test

10 Marks: Assignments

Scheme of Evaluation for Internal Assessment (30 Marks)

- Internal Assessment test in the same pattern as that of the main examination (Avg. of three Tests): 30 marks.
- Class work (Assignment writing on all modules): 10 Marks.

SCHEME OF EXAMINATION:

Two main questions to be set from syllabus covered up to IA tests. Student must answer two full main questions and each question is for 15 Marks.

Q.No-I or Q.No-II	= 15 Marks
Q.No-III or Q.No-IV	= 15 Marks
Total	= 30 Marks

12.0**Course Delivery Plan**

Module	Lecture No.	Content of Lecturer	% of Portion
MODULE 1:	1	. Brief history of the x86 family, Inside the 8088/86	20
	2	Introduction to assembly programming, Introduction to Program Segments	
	3	The Stack, Flag register, x86 Addressing Modes	
	4	Directives & a Sample Program	
	5	Assemble, Link & Run a program	
	6	More Sample programs, Control Transfer Instructions	
	7	Data Types and Data Definition,	
	8	Full Segment Definition,	
	9	Flowcharts	
	10	Pseudo code	
MODULE 2:	1	. Instructions sets description	20
	2	Arithmetic and logic instructions and programs: Unsigned Addition and Subtraction	
	3	Unsigned Multiplication and Division, Logic Instructions	
	4	BCD and ASCII conversion, Rotate Instructions.	
	5	INT 21H and INT 10H Programming	
	6	Bios INT 10H Programming	
	7	DOS Interrupt 21H.	
	8	8088/86 Interrupts,	
	9	x86 PC	
	10	Interrupt Assignment	
	1	.Signed Numbers and Strings: Signed number Arithmetic Operations,	20



MODULE 3:	2	String operations.	
	3	Memory and Memoryinter facing: Memory addressed coding,	
	4	Data integrity in RAM and ROM,	
	5	16-bitmemoryinterfacing.	
	6	8255 I/O programming	
	7	I/O addresses MAP of x86 PC's,.	
	8	Programming	
	9	Programming	
	10	Interfacing the 8255	
MODULE 4:	1	Microprocessors versus Microcontrollers,	20
	2	ARM Embedded Systems :The RISC design	
	3	philosophy, The ARM Design Philosophy	
	4	,Embedded System Hardware, Embedded System Software,	
	5	ARM Processor Fundamentals : Registers ,	
	6	Current Program Status Register ,	
	7	Pipeline, Exceptions	
	8	Interrupts	
	9	Vector Table ,	
	10	Core Extensions	
MODULE5:	1	Introduction to the ARM Instruction Set : Data Processing Instructions,	20
	2	Branch Instructions,	
	3	Branch Instructions	
	4	Software Interrupt Instructions	
	5	Software Interrupt Instructions	
	6	Program Status Register Instructions,	
	7	Program Status Register Instructions,	
	8	Coprocessor Instructions	
	9	Loading Constants,	
	10	Simple programming exercises	

**13.0 Assignments, Pop Quiz, Mini Project, Seminars**

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on The x86 microprocessor	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 syllabus	2	Individual Activity. Printed solution expected.	Text book 1
2	Assignment 2: University Questions on Arithmetic and logic instructions and programs	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 syllabus	4	Individual Activity. Printed solution expected.	Text book 1
3	Assignment 3: University Questions on Signed Numbers and Strings	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 syllabus	6	Individual Activity. Printed solution expected.	Text book 1
4	Assignment 4: University Questions on ARM Embedded Systems	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 syllabus	8	Individual Activity. Printed solution expected.	Text book 2
5	Assignment 5: University Questions on Introduction to ARM Instruction Set	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 syllabus	10	Individual Activity. Printed solution expected.	Text book 2

14.0 Assignment Questions

Assignment No	Questions	Marks
I	1. Differentiate between microprocessor and microcontroller? 2. What is an instruction queue? Explain? 3. Explain the instructions (i) LDS (ii) PUSHF (iii) TEST (iv) CLD	5marks 5marks 5marks
II	1. What are the flags in 8086? 2. Which interrupts are generally used for critical events? 3. Explain different types of registers in 8086 microprocessor arch	5marks 5marks 5marks
III	1. Explain the purpose of the I/O instructions IN and OUT 2. Compare CALL and PUSH instruction 3. Draw and explain the timing diagram of memory read cycle	5marks 5marks 5marks
IV	1. Explain how a constant is loaded into a general purpose register of ARM processor 2. Describe ARM register set? Also specify the flags in ARM-7 processor? 3. Explain the concept of thumb instructions in ARM processor?	10 Marks 10 Marks 10 Marks
V	1. Describe the timer hardware behind LPC 2148 with various initialization register? 2. What is current program status register? Explain the generic structure of program status register as ARM core	10 Marks 10 Marks

15.0 QUESTION BANK**Module-I:**

1. What is microprocessor and explain
2. Differentiate between microprocessor and micro controllers
3. Explain different instruction sets of 8086
4. Explain flag register

**Module-II:**

1. Explain different types of instructions in 8086
2. How BCD to ASCII conversion can be done
3. What is interrupt and explain it
4. Explain different interrupts used in 8086
5. Write a short note on interrupt assignment

Module-III:

1. Explain string operations used in 8086
2. What is I/O address map and explain it
3. Explain interfacing of 8255
4. Explain the architecture of 8255
5. Explain io address map of 8086

Module-IV:



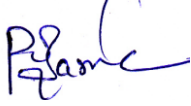

1. Define ARM processor
2. What are the different registers used in ARM
3. What are the different registers are used in ARM
4. Explain pipelining concept in ARM
5. Write a short note on vector table and core extension

Module-V:

1. Define branch and data instruction in ARM
2. Explain different types of registers in ARM
3. Define flag register and explain
4. With neat diagram explain ARM

16.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by	Checked by		
			
Prof. N K Honnagoudar	Prof. N K Honnagoudar	HOD	Principal



Subject Title	SOFTWARE ENGINEERING		
Subject Code	17CS45	IA Marks	40
Number of Lecture Hrs / Week	04	Exam Marks	60
Total Number of Lecture Hrs	50	Exam Hours	03
Credits-04			

FACULTY DETAILS:

Name: Prof. Mohan A. Gholap	Designation: Asst. Professor	Experience: 2 Years Teaching
No. of times course taught: 02	Specialization: Computer Science & Engg.	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Common to all branches	I/II	Programming in C & Data Structures
02	Computer Science & Engineering	III	Computer Organization

2.0 Course Objectives

Course objectives: This course will enable students to

1. Outline Software Engineering principles and activities involved in building large software programs.
2. Identify ethical and professional issues and explain why they are of concern to software engineers.
3. Describe the process of requirements gathering, requirements classification, requirements specification and requirements validation.
4. Differentiate system models, use UML diagrams and apply design patterns.
5. Discuss the distinctions between validation testing and defect testing.
6. Recognize the importance of software maintenance and describe the intricacies involved in software evolution.
7. Apply estimation techniques, schedule project activities and compute pricing.
8. Identify software quality parameters and quantify software using measurements and metrics.
9. List software quality standards and outline the practices involved.
10. Recognize the need for agile software development, describe agile methods, apply agile practices and plan for agility.

3.0 Course Outcomes

After successfully completing this course, the students will be able to:

CO	Description	Level	Mapped POs/ PSOs
C214.1	Explain the fundamentals of software, requirement engineering and software process models.	L2	PO1, PO2, PO3, PO5, PO7, PSO1, PSO2
C214.2	Apply the knowledge of system models for development of software.	L3	PO1, PO2, PO3, PO4, PO5, PO9, PSO1, PSO2
C214.3	Explain software testing techniques & evolution processes.	L2	PO1, PO2, PO3, PO4, PO7, PSO1, PSO2
C214.4	Apply the techniques, skills, and modern engineering tools for project planning & quality management.	L3	PO1, PO2, PO3, PO5, PSO1, PSO2
C214.5	Explain the Agile software development methods.	L2	PO1, PO2, PO3, PO9, PSO1
Total Hours of instruction		50	

4.0 Course Content**Module – 1****(12 Hours)**

Introduction: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. **Software Processes:** Models: Waterfall Model (Sec 2.1.1), Incremental Model (Sec2.1.2) and Spiral Model (Sec 2.1.3). Process activities. **Requirements Engineering:** Requirements Engineering Processes (Chap 4). Requirements Elicitation and Analysis (Sec 4.5). Functional and non-functional requirements (Sec 4.1). The software



Requirements Document (Sec 4.2). Requirements Specification (Sec 4.3). Requirements validation (Sec 4.6). Requirements Management (Sec 4.7).

Module -2**(11 Hours)**

System Models: Context models (Sec 5.1). Interaction models (Sec 5.2). Structural models (Sec 5.3). Behavioral models (Sec 5.4). Model-driven engineering (Sec 5.5). **Design and Implementation:** Introduction to RUP (Sec 2.4), Design Principles (Chap 17). Object-oriented design using the UML (Sec 7.1). Design patterns (Sec 7.2). Implementation issues (Sec 7.3). Open source development (Sec 7.4).

Module- 3**(09 Hours)**

Software Testing: Development testing (Sec 8.1), Test-driven development (Sec 8.2), Release testing (Sec 8.3), User testing (Sec 8.4). Test Automation (Page no 42, 70, 212, 231, 444, 695). **Software Evolution:** Evolution processes (Sec 9.1). Program evolution dynamics (Sec 9.2). Software maintenance (Sec 9.3). Legacy system management (Sec 9.4).

Module- 4**(10 Hours)**

Project Planning: Software pricing (Sec 23.1). Plan-driven development (Sec 23.2). Project scheduling (Sec 23.3): Estimation techniques (Sec 23.5). **Quality management:** Software quality (Sec 24.1). Reviews and inspections (Sec 24.3). Software measurement and metrics (Sec 24.4). Software standards (Sec 24.2)

Module -5**(08 Hours)**

Agile Software Development: Coping with Change (Sec 2.3), The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref "The SCRUM Primer, Ver 2.0") and Extreme Programming (Sec 3.3). Plan-driven and agile development (Sec 3.2). Agile project management (Sec 3.4), Scaling agile methods (Sec 3.5).

5.0 Relevance to future subjects

SI No	Semester	Subject	Topics
01	VII, VIII	Project work	Software processes and Models.
02	V	Management & Entrepreneurship for IT Industry	Software Engineering basics with respect to IT Industry
03	V	Introduction to Software Testing	Software Testing, Verification and Validation

6.0 Relevance to Real World

SI No	Real World Mapping
01	Design of a Software applications
02	Development of a Software applications
03	Testing of a Software applications

7.0 Books Used and Recommended to Students

Text Books
1. I An Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012. (Listed topics only from Chapters 1, 2, 3, 4, 5, 7, 8, 9, 23, and 24)
2. The SCRUM Primer, Ver 2.0, http://www.goodagile.com/scrumprimer/scrumprimer20.pdf
Reference Books
1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, TataMcGraw Hill.
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India
Additional Study material & e-Books
1. http://agilemanifesto.org/
2. http://www.jamesshore.com/Agile-Book/

8.0 Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References
1. http://hsit.ac.in/E-LEARNING
2. https://sourceforge.net/
3. www.nptel.ac.in

**9.0 Magazines/Journals Used and Recommended to Students**

Sl.No	Magazines/Journals	Website
1	Advances in Engineering Software	https://www.journals.elsevier.com/advances-in-engineering-software
2.	IEEE Software	https://www.computer.org/software-magazine/
3.	Journal of Software Engineering Research & Development	https://jserd.springeropen.com/

10.0 Examination Note**Internal Assessment: 20+10=30 Marks**

30 Marks: Internal Assessment test

10 Marks: Assignments

Scheme of Evaluation for Internal Assessment (30 Marks)

- Internal Assessment test in the same pattern as that of the main examination (Avg. of three Tests): 30 marks.
- Class work (Assignment writing on all modules): 10 Marks.

SCHEME OF EXAMINATION:

Two main questions to be set from syllabus covered up to IA tests. Student must answer two full main questions and each question is for 15 Marks.

Q.No-I or Q.No-II	= 15 Marks
Q.No-III or Q.No-IV	= 15 Marks
Total	= 30 Marks

Average of three IA's will be added with assignment marks and final evaluation will be done for 40 marks.

INSTRUCTIONS FOR SOFTWARE ENGINEERING (17CS45) EXAMINATION

- Restriction of timing for main examination (The total duration is 3 hours).
- Total 10 questions in main examination and each module is covered by two full main questions.
- Total marks of Software Engineering paper is 100 marks and each question is of 20 marks. (Marks scored out of 100 will be reduced out of 60).

11.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
MODULE 1	1	Introduction: Software Crisis, Need for Software Engineering.	24%
	2	Professional Software Development, Software Engineering Ethics	
	3	Case Studies	
	4	Software Processes: Models: Waterfall Model (Sec 2.1.1)	
	5	Incremental Model (Sec 2.1.2) and Spiral Model (Sec 2.1.3).	
	6	Process activities	
	7	Requirements Engineering Processes (Chap 4)	
	8	Requirements Elicitation and Analysis (Sec 4.5)	
	9	Functional and non-functional requirements (Sec 4.1).	
	10	The software Requirements Document (Sec 4.2). Requirements Specification (Sec 4.3).	
	11	Requirements validation (Sec 4.6)	
	12	Requirements Management (Sec 4.7)	
MODULE 2	13	Context models (Sec 5.1)	22%
	14	Interaction models (Sec 5.2)	
	15	Structural models (Sec 5.3)	
	16	Behavioral models (Sec 5.4)	
	17	Model-driven engineering (Sec 5.5)	
	18	Design and Implementation: Introduction to RUP (Sec 2.4)	
	19	Design Principles (Chap17)	
	20	Object-oriented design using the UML (Sec 7.1)	
	21	Design patterns (Sec 7.2)	
	22	Implementation issues (Sec 7.3)	
	23	Open source development (Sec 7.4)	



MODULE 3	24	Software Testing: Development testing (Sec 8.1)	18%
	25	Test-driven development (Sec 8.2)	
	26	Release testing (Sec 8.3)	
	27	User testing (Sec 8.4)	
	28	Test Automation (Page no 42, 70,212, 231,444,695)	
	29	Software Evolution: Evolution processes (Sec 9.1)	
	30	Program evolution dynamics (Sec 9.2)	
	31	Software maintenance (Sec 9.3)	
MODULE 4	32	Legacy system management (Sec 9.4)	20%
	33	Project Planning: Software pricing (Sec 23.1)	
	34	Plan-driven development (Sec 23.2)	
	35	Project scheduling (Sec 23.3)	
	36	Continued...	
	37	Estimation techniques (Sec 23.5)	
	38	Quality management: Software quality (Sec 24.1)	
	39	Continued...	
MODULE 5	40	Reviews and inspections (Sec 24.3).	16%
	41	Software measurement and metrics (Sec 24.4).	
	42	Software standards (Sec 24.2)	
	43	Agile Software Development: Coping with Change (Sec 2.3)	
	44	The Agile Manifesto: Values and Principles.	
	45	Agile methods: SCRUM (Ref "The SCRUM Primer, Ver 2.0")	
	46	Continued..	
	47	Extreme Programming (Sec 3.3)	
48	Plan-driven and agile development (Sec 3.2)		
49	Agile project management (Sec 3.4)	16%	
50	Scaling agile methods (Sec 3.5)		

12.0**QUESTION BANK****Module: 1**

1. What is software? What are the attributes of good software?[Dec 2011, June 2010, Jan 2010]
2. Describe four Ethics & Professional responsibilities of a software engineer. [Jan 2009, Dec 2011]
3. List and explain any five Software Engineering codes of ethics. [Jan 2018]
4. Answer the following FAQ in software engineering-
 - a. Difference between software engineering and system engineering.
 - b. What is software process model?
 - c. What are the key challenges facing software engineering? [June 2014] [Jan 2018]
5. What is a software process model? Explain the types of software process models.[Jan 2015]
6. What are the four important attribute which all software products should have? Explain.[Jan 2016]
7. Describe functional and non-functional requirements with examples. [Jan 10, June 10, Dec 11] [10M]
8. What are the metrics used to specify non-functional system properties?[June 10] [5 M]
9. Explain the IEEE standard format for requirement document in detail.[June 10, Jan 09, Dec 11]
10. Explain requirements elicitation and analysis process and its activities. [Jan10, June 10, Dec 11]
11. Why requirements need to be validated? Explain the check made in requirement validation.[June 10, July 09]
12. Explain briefly the techniques of requirements discovery. [Jan 2015]
13. Explain functional, non-functional and domain requirements with atleast one example for each. [Jan 2018]
14. Explain the following: i) Ethnography ii) Scenario. [Jan 2016]
15. What are the fundamental activities of Software Engineering? [Jun 2016]
16. With a neat diagram explain the waterfall model of software development process [Jun 2016]
17. With a neat diagram explain the rational unified process[Jun 2016]
18. What is requirement specification? Explain various ways of writing system requirements.[Jun 2016]
19. Why the Understanding of requirements from stakeholders is difficult task? Explain.[Jun 2016]
20. Explain the different checks to be carried out during requirement validation process.[Jun 2016]

Module -2

1. What is data-flow model? With an example show the notations used in data flow model.[Jan 10]



2. Explain the object aggregation with example. [Jan 09]
3. Draw and explain state transition model of a simple microwave oven.[July 09/Jan 2016]
4. Describe the three categories of risks. Explain different stages in risk management. [Jan 10]
5. Draw the state machine model of microwave oven. What is the object aggregation?
Write an example showing aggregation with notation. [June 2014]/[Jan 2015]
6. With a figure, explain phases in RUP. [June 2010]
7. With diagram explain Rational unified process. [Jan 2016] [Jan 2018]
8. Explain object oriented design using the UML.
9. Discuss design patterns with examples.
10. List out the activities in object oriented Design process. [Jan 2018]
11. Write a short note on open source licensing.
12. Draw a context model for patient information system. How the interactions are modeled?[Jun 2016]
13. Explain the terms class diagram, generalization and aggregation.[Jun 2016]
14. What is model driven engineering? State the three types of abstract system models produced.[Jun 2016]
15. What are the things to be done for a design of object oriented system? How the objects are identified?[Jun 2016]
16. What is design pattern? Explain four elements of design pattern.[Jun 2016]
17. What is software reuse? State the general models of open source licenses.[Jun 2016]

Module- 3

1. What are the distinctions between release testing and system testing during the development process? Explain release testing.
2. What are types of user testing? Explain.
3. State and explain development testing and its three levels- Unit testing, Component testing and System testing. [Jan 2018]
4. With example explain equivalence partitioning.
5. Discuss software evolution process with net diagram. [Jan 2018]
6. List out all the guidelines for testing. [Jan 2018]
7. Explain Lehman's laws. [Jan 2018]
8. Explain Test-Driven development (TDD), with a block diagram. Explain TDD activities and benefits of TDD. [Jan 2018]
9. What are the different types of software maintenance? Explain maintenance prediction.
10. With diagram explain system reengineering.
11. Explain legacy system management.
12. What are the factors used in environment assessment during legacy system management?
13. What are the factors used in application assessment during legacy system management?
14. State the two goals and three levels of granularity of software testing process.
15. What is test driven development? State the benefits of test driven developments.
16. Explain the six stages of acceptance testing process.[Jun 2016]
17. With a neat diagram, show the software evolution process and explain the Lehman's law concern to system change. [Jun 2016]
18. What is software maintenance? State the activities of re-engineering process.[Jun 2016]

Module- 4

1. What are the factors affecting software pricing? Explain. [Jan 2018]
2. Explain the project process with neat diagram.
3. Explain the project scheduling in detail.
4. Refer table below for task durations and interdependencies:

Task	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	T ₈	T ₉	T ₁₀
Duration in days	9	16	11	15	7	20	26	15	15	16
Interdependencies	-	-	-	T ₁ (M ₁)	T ₁ T ₂ (M ₂)	T ₂ T ₃ (M ₃)	T ₃ (M ₅)	T ₄ T ₅ (M ₄)	T ₅ T ₆ (M ₆)	T ₈ (M ₇)

Table below sets out the number of activities, duration and dependencies. Draw an activity chart showing the project schedule. Find the critical path.

Task	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	T ₈	T ₉	T ₁₀	T ₁₁	T ₁₂
Duration in days	8	15	15	10	10	5	20	15	15	15	7	10
Interdependencies			T ₁ (M ₁)		T ₂ T ₄ (M ₂)	T ₁ T ₂ (M ₃)	T ₁ (M ₁)	T ₄ (M ₅)	T ₃ T ₆ (M ₄)	T ₅ T ₇ (M ₇)	T ₉ (M ₆)	T ₁₁ (M ₈)



5. Explain the COCOMO II model.
6. List and explain various COCOMO cost estimation models. [Jan 2018]
7. What are the principles of software quality management? Explain.
8. List out the questions to be answered by the quality management team to divide whether or not the software is fit for its intended purpose. [Jan 2018]
9. Why software standards are important? Justify.
10. Explain the ISO 9001 standard framework.
11. What are product metrics? Explain its two classes. [Jan 2018]
12. Discuss software review process.
13. What are the checks to be made during program inspection process? [Jan 2018]
14. Explain the process of product measurement with neat diagram
15. Explain the factors to be considered for approval of change.[Jun 2016]
16. Explain the features provided by version management sessions.[Jun 2016]
17. What is configuration management? State its four activities.[Jun 2016]
18. What is system building? State the features available in the system building tools.[Jun 2016]
19. Explain the factors to be considered for release planning of the system[Jun 2016]

Module -5

1. Explain Boehm's spiral model with neat diagram.
2. With diagram, explain the phases of RUP.
3. Iteration in RUP is supported in two ways, justify
4. Draw the block diagram and explain the process of prototype development. What are the benefits of a prototype? Write briefly about Throw away prototypes. [Jan 2018]
5. Explain Extreme Programming (XP) release cycle and its practices in detail. [Jan 2018]
6. What are the key strategies testing in XP? [Jan 2018]
7. List all the four key features of testing in XP. [Jan 2018]
8. What is Pair programming? List the advantages of Pair programming. [Jan 2018]
9. What are the distinctions between plan-driven and agile approaches to system specification?
10. How to balance between a plan-based and an agile approach? Explain.
11. Explain the scrum management process with neat diagram.
12. Explain how large software system development is different from small system development.
12. Explain the ways of coping with the change and reduction of rework cost.[Jun 2016]
13. Explain the practices involved in the extreme programming.[Jun 2016]
14. State the principles of agile methods.[Jun 2016]
15. How the agile methods are scaled? State the coping of agile methods for large system engineering.[Jun 2016]
16. Write a note on pair programming.[Jun 2016]
17. Explain SCRUM. Draw and explain block diagram for the SCRUM process. List all the key characteristics of this process. Mention the advantages of SCRUM. [Jan 2018]

13.0**University Result**

Examination	S+	S	A	B	C	D	E	% Passing
NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by	Checked by		
Prof. Mohan A. Gholap	Dr. Parashuram C. Baraki	HOD	Principal



Subject Title	DATA COMMUNICATION		
Subject Code	17CS46	IA Marks	40
Number of Lecture Hrs / Week	04	Exam Marks	60
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 04			

FACULTY DETAILS:

Name: Prof. Manojkumar A Chitale	Designation: Asst. Professor	Experience: 5.5Years
No. of times course taught: 01		Specialization: Computer Network Engineering

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science and Engineering	I/II	Programming in C and Data Structures
02	Computer Science and Engineering	III	Discrete Mathematics and Applications

2.0 Course Objectives

1. Comprehend the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
2. Explain with the basics of data communication and various types of computer networks;
3. Illustrate TCP/IP protocol suite and switching criteria.
4. Demonstrate Medium Access Control protocols for reliable and noisy channels.
5. Expose wireless and wired LANs along with IP version.

3.0 Course Outcomes

After studying this course, students will be able to

CO	Course Outcome	Cognitive Level	POs/PSOs
C215.1	Illustrate basic computer network technology.	L2	PO1,PO2,PO5,PO8, PO10,PO12,PSO1, PSO2
C215.2	Identify the different types of network topologies and protocols.	L2	PO1,PO2,PO5,PO8, PO10,PO12,PSO1, PSO2
C215.3	List and explain the layers of OSI and TCP/IP model	L2	PO1,PO2,PO5,PO8, PO10,PO12,PSO1, PSO2
C215.4	Comprehend different types of network devices and their functions within a network.	L2	PO1,PO2,PO5,PO8, PO10,PO12,PSO1, PSO2
C215.5	Demonstrate subnetting and routing mechanisms.	L2	PO1,PO2,PO5,PO8, PO10,PO12,PSO1, PSO2
Total Hours of instruction			50

4.0 Course Content**MODULE 1****(10 Hours)**

Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration, **Networks Models:** Protocol Layering, TCP/IP Protocol suite, The OSI model, **Introduction to Physical Layer-1:** Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance, **Digital Transmission:** Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding).

MODULE 2**(10 Hours)**

Physical Layer-2: Analog to digital conversion (only PCM), Transmission Modes, **Analog Transmission:** Digital to analog



conversion, **Bandwidth Utilization:** Multiplexing and Spread Spectrum, **Switching:** Introduction, Circuit Switched Networks and Packet switching.

MODULE 3**(10 Hours)**

Error Detection and Correction: Introduction, Block coding, Cyclic codes, Checksum, Forward error correction, **Data link control:** DLC services, Data link layer protocols, HDLC, and Point to Point protocol (Framing, Transition phases only).

MODULE 4**(10 Hours)**

Media Access control: Random Access, Controlled Access and Channelization, **Wired LANs Ethernet:** Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, **Wireless LANs:** Introduction, IEEE 802.11 Project and Bluetooth.

MODULE 5**(10 Hours)**

Other wireless Networks: WIMAX, Cellular Telephony, Satellite networks, **Network layer Protocols:** Internet Protocol, ICMPv4, Mobile IP, **Next generation IP:** IPv6 addressing, The IPv6 Protocol, The ICMPv6 Protocol and Transition from IPv4 to IPv6.

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VIII	Project work	Computer networks related projects

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Design computer network solutions
02	Development of a software applications

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Numerical Solving
02	NPTEL	Basic Computer Concepts

8.0 Books Used and Recommended to Students

Text Books
1. Behrouz A. Forouzan, Data Communications and Networking 5E, 5th Edition, Tata McGraw-Hill, 2013. (Chapters 1.1 to 1.5, 2.1 to 2.3, 3.1, 3.3 to 3.6, 4.1 to 4.3, 5.1, 6.1, 6.2, 8.1 to 8.3, 10.1 to 10.5, 11.1 to 11.4, 12.1 to 12.3, 13.1 to 13.5, 15.1 to 15.3, 16.1 to 16.3, 19.1 to 19.3, 22.1 to 22.4)
Reference Books
1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4 th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007
Additional Study material & e-Books
1. Andrew S. Tanenbaum , Computer Networks, 5 th Edition
2. Kuros Ross, Computer Networks a Top Down Approach, 6 th Edition, Pearson Education.

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
1. https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm

10.0 Magazines/Journals Used and Recommended to Students



Sl.No	Magazines/Journals	Website
1	The International Journal of Computer and Telecommunications Networking	https://www.journals.elsevier.com/computer-networks/
2	The Journal of Network and Computer Applications	https://www.journals.elsevier.com/journal-of-network-and-computer-applications/

11.0 Examination Note

Internal Assessment: 30+10=40 Marks

30 marks –from three internal assessment test

10 marks- from the assignments

Scheme of Evaluation for Internal Assessment (30 Marks)

a) Internal Assessment test in the same pattern as that of the main examination

(Better of the two Tests):30marks.

b) Assignment marks for each module is 25. Average of 5 assignment marks will be taken and finally scale down to 10 marks.

Question Paper Pattern (IA):

- Two main questions to be set from syllabus covered up to IA tests.
- Student has to answer two full main questions and each question carries 12/13 marks, Total test marks are 25.
 - Q.No I or Q.No II =15 Marks
 - Q.No III or Q.No IV =15 Marks
 - Total =30 Marks**

Question Paper Pattern and instructions (Main Exam):

- The question paper will have TEN questions.
- There will be TWO questions from each module.
- Each question will have questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Max. Marks: 100 and each question carries 20 marks. Exam Duration: 3 Hrs.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	1	Introduction to Data Communications	20
	2	Networks, Network Types,	
	3	Internet History, Standards and Administration	
	4	Networks Models: Protocol Layering	
	5	TCP/IP Protocol suite, The OSI model	
	6	Introduction to Physical Layer-1: Data and Signals	
	7	Transmission Impairment	
	8	Data Rate limits	
	9	Performance	
	10	Digital Transmission: Digital to digital conversion	
2	11	Physical Layer-2: Analog to digital conversion (only PCM)	20
	12	Transmission Modes	
	13	Analog Transmission: Digital to analog conversion	
	14	Continued...	
	15	Bandwidth Utilization: Multiplexing and Spread Spectrum	
	16	Continued...	
	17	Switching: Introduction	
	18	Circuit Switched Networks	
	19	Packet switching	
	20	Continued...	
3	21	Error Detection and Correction: Introduction	20
	22	Block coding	
	23	Cyclic codes	
	24	Checksum	
	25	Forward error correction	



	26	Data link control: DLC services	
	27	Data link layer protocols	
	28	HDLC	
	29	Point to Point protocol	
	30	Continued...	
4	31	Media Access control: Random Access	20
	32	Controlled Access and Channelization	
	33	Continued...	
	34	Wired LANs Ethernet: Ethernet Protocol	
	35	Standard Ethernet	
	36	Fast Ethernet	
	37	Gigabit Ethernet and 10 Gigabit Ethernet	
	38	Wireless LANs: Introduction	
	39	IEEE 802.11 Project	
	40	Bluetooth	
5	41	Other wireless Networks: WIMAX	20
	42	Cellular Telephony	
	43	Satellite networks	
	44	Network layer Protocols : Internet Protocol	
	45	ICMPv4	
	46	Mobile IP	
	47	Next generation IP: IPv6 addressing	
	48	The IPv6 Protocol	
	49	The ICMPv6 Protocol and Transition from IPv4 to IPv6	
	50	Continued...	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book / website / Paper
1	Assignment 1: University Questions on Module 1	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Printed Activity. solution expected.	Book 1
2	Assignment 2: University Questions on Module 2	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Printed Activity. solution expected.	Book 1
3	Assignment 3: University Questions on Module 3	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Printed Activity. solution expected.	Book 1
4	Assignment 4: University Questions on Module 4	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Printed Activity. solution expected.	Book 1
5	Assignment 5: University Questions on Module 5	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	10	Individual Printed Activity. solution expected.	Book 1

14.0 QUESTION BANK

**Module - 1**

1. What is data communication? List and explain the five characteristics of a data communication system, with examples.
2. What are the five important components of data communications?
3. Give the comparison between LAN, MAN and WAN with an example.
4. Describe with a neat diagram. The functionalities of each layer in the TCP/IP model.
5. Differentiate between: i) ARP and RARP ii) ICMP and IGMP iii) UDP and TCP.
6. With neat diagram explain mesh topology with applications of each.
7. What are standards? Name any four standard organizations.
8. Name and explain four topologies of computer networks.
9. What is Protocol? What are the key elements of a protocol?
10. Explain different transmission modes.
11. For n devices in n/w, what is the number of cable links required for a mesh, ring and star topologies?
12. Explain the different level of addressing used in an internet with a suitable example for each level of addressing in TCP/IP?
13. An analog signal has a bandwidth of 40 kHz. If we use four levels in the signal. What is the minimum bandwidth of the digital signal?
14. What is the Nyquist sampling rate for each of the following signals? i) A low pass signal with bandwidth of 200 kHz. ii) A band pass signal with bandwidth of 300 kHz having lowest frequency of 200 kHz.
15. We want to digitize the human voice. What is the bit rate, assuming 8 bits per sample?
16. Discuss 8b/10b coding scheme.
17. Explain the delta modulation.
18. Suppose an application layer wants to send 100-bytes message to its peer process using the existing TCP connection. The TCP consists of message plus 20 bytes of header. The segment is encapsulated into IP packet that has an additional 20 bytes of header. The IP packet in turn goes inside the Ethernet frame that has 18 bytes of header and trailer. What percentages of the transmitted byte in the physical layer correspond to the message information?
19. Define bandwidth. A periodic signal has a bandwidth of 20 Hz. The highest frequency is 60Hz. What is the lowest frequency? Draw the spectrum, if the signal contains all frequencies of the same amplitude.
20. Explain briefly, with neat figures, the two approaches for digital transmission.
21. A signal travels through an amplifier and the power is increased 10 times. Calculate the power gained.
22. Explain three causes of transmission impairments.
23. What is data communication? With neat diagram, explain four basic topologies. (June/July 2017 -05 marks)
24. Explain TCP/IP protocol suite with encapsulation decapsulation process. (June/July 2017 -08 marks)
25. Explain different characteristics of periodic analog signal. Find the phase in degree and radian of a sine wave with offset $\frac{1}{4}$ cycle with respect to time '0'(zero). (June/July 2017 -03 marks)
26. Draw line codes of the sequence 010011 using NRZ, NRZ-L, NRZ-I, Manchester, RZ and differential Manchester schemes. (June/July 2017 06 marks)
27. Explain digital signal transmission methods. (June/July 2017 -06 marks)
28. What is noiseless channel? Find out maximum bit rate in noiseless channel with a bandwidth of 3000Hz transmitting a signal with two signal level. (June/July 2017 -04 marks)
29. Define data communication. Explain the fundamental characteristics of a data communication system. With a neat diagram explain the components of data communication? (Dec-17/Jan 18 -06 marks)
30. Explain TCP/IP protocol suite of computer networks with neat diagram. (Dec-17/Jan 18 -08 marks)
31. Assume that five devices are connected in mesh topology. How many duplex links are needed? How many ports are needed for each? (Dec-17/Jan 18 -02 marks)
32. Explain different causes for transmission impairments during signal transmission through media. (Dec-17/Jan 18 -06 marks)
33. Define line coding. List out its characteristics. Represent the sequence 10100110 using polar and biphase schemes. (Dec-17/Jan 18 -08 marks)
34. A network with bandwidth of 10 Mbps can pass only an average of 18000 frames per minute with each frame carrying an average of 10000 bits. What is the throughput of this network. (Dec-17/Jan 18 -02 marks)
35. Define data communication. Explain any two fundamental characteristics of a data communication and basic network topology. (June/July 18 -08 marks)
36. List out the causes of transmission impairment. Explain the characteristics of analog and digital signals. (June/July 18 -08 marks)
37. List out the network criteria. Explain TCP/IP protocol suite with neat diagram. (June/July 18 -08 marks)
38. Define Line coding and list out its characteristics. Represent the following sequence 1011001011 using polar and bipolar scheme. (June/July 18 -08 marks)

Module 2

1. Describe with neat waveform any two polar line coding schemes.
2. Give data rate formula suggested by Nyquist and Shannon. Low pass communication has BW of 1 m Hz .what is the Shannon capacity of the channel if SNR is 40 dB? What bit rate is attained using 8-level pulses?



3. Calculate the Shannon channel capacity in the following cases: BW 20 kHz SNR dB 40; BW =200 kHz SNR dB 6.
4. A file contains 3 million bytes. How long does it take to download this file using a 100 kbps channel?
5. Define line coding. Describe Unipolar NRZ, polar NRZ-L, Bipolar AMI and Manchester encoding by applying on the information sequence 101011100.
6. Define the following: Bandwidth, Through Put, Transmission Time, Latency and Jitter.
7. What is time division multiplexing? Explain how statistical TDM overcomes the disadvantages of synchronous TDM.
8. Explain phase shift keying in detail.
9. An analog signal has a bit rate of 10000 bps and the bandwidth of 2000 baud. How many data elements are carried by each signal element? How many signal elements do we need?
10. An analog signal has a bit rate of 8000bps and a baud rate of 1000 baud. How many data elements are carried by each signal element? How many signal elements do we need?
11. Define and explain synchronous TDM.
12. Explain the amplitude modulation.
13. A voice grade channel of a telephone network has a bandwidth of 3.4 kHz, Calculate i) channel capacity for S/N=30Db ii) S/N required to support information transfer at 4800 bps.
14. What is FDM? Briefly explain its multiplexing and de-multiplexing process.
15. Explain briefly the two spread spectrum techniques.
16. With a neat waveform. Explain three methods of digital to analog conversion. Draw waveform with input data 110100.
17. What is multiplexing? With neat diagram explain FDM.
18. What is TDM? Four sources create 250 characters per second. The frame contains one character from each source and one extra bit for synchronization. Find i) the data rate of each source. ii) Duration of each character in each source. iii) The frame rate iv) duration of output frame. v) Frame size in bits. vi) Data rate of link.
19. We have four sources, each creating 250 characters /sec. if the interleaved unit is one character and 1 synchronization bit is added to each frame, find i) The data rate of each source. ii) The duration of each character in each source. iii) The frame rate. iv) The duration of each frame. v) The no of bits in each frame. vi) The data rate of the link.
20. Describe ASK, FSK and PSK mechanisms and apply them over the digital data 101101.
21. Explain how TDM differs from FDM, with neat diagram.
22. What is switching? Differentiate circuit switch network with packet switched network.
23. Explain PCM and quantization process with steps and example. (June/July 2017 -08 marks)
24. Explain amplitude shift keying modulation process. (June/July 2017 -04 marks)
25. Find out bit rate if available bandwidth is 100 KHz which spans from 200 to 300KHz. Consider ASK with $d=1$ $r=1$. (June/July 2017 -04 marks)
26. What is multiplexing ? Define synchronous TDM with data rate management strategies. (June/July 2017 -08 marks)
27. What is spread spectrum ? Explain FHSS and bandwidth sharing. (June/July 2017 -08marks)
28. Explain with suitable diagram PCM encoder used for analog to digital conversion with example. (Dec-17/Jan 18 -06 marks)
29. Define multiplexing. State and explain the data rate management to handle disparity in input data rates in TDM. (Dec-17/Jan 18 -05 marks)
30. Four 1 Kbps connections are multiplexed together. A unit is 1 bit. Find i) duration of 1 bit before multiplexing ii) transmission rate of link iii) duration of each time slot. (Dec-17/Jan 18 -03 marks)
31. Briefly explain with neat diagrams ASK and FSK modulation techniques and specify the bandwidth requirements. (Dec-17/Jan 18 -08 marks)
32. We need to send data 3 bits at a time at a bit rate of 3Mbps.the carrier frequency is 10MHz. calculate the number of levels(different frequencies, band rate and bandwidth). (Dec-17/Jan 18 -04 marks)
33. Explain how the message can be sent from one system to another using datagram approach and calculate total delay with appropriate diagrams. (Dec-17/Jan 18 -06 marks)
34. List out the types of transmission modes. Explain the steps of pulse code modulation process with an example. (June/July 18 -08 marks)
35. Explain FSK and QAM modulation process with suitable example. (June/July 18 -08 marks)
36. Define Multiplexing. Explain synchronous TDM with data rate management and its limitations. (June/July 18 -10 marks)
37. List out three phases of circuit-switched network. Explain Datagram-switched network. (June/July 18 -06 marks)

Module - 3

1. Draw a CRC encoder and decoder for CRC code with C (7, 4). Also explain how this CRC design works, with an example.
2. Define line of sight propagation.
3. Explain the checksum with an example.
4. Explain the types of errors.
5. Find the code word C(x) for the information $d(x) = x^3 + 1$ with the generator polynomial $t(x) = x^3 + x + 1$.



6. What is hamming distance? Explain simple parity check code $C(5, 4)$ with $d_{\min} = 1$. How many bits can be corrected?
7. What is CRC? If the generating polynomial for CRC code is $x^4 + x^3 + 1$ and message word is 11110000 determine check bits and coded word.
8. What is internet checksum? List the steps undertaken by sender and receiver for error detection.
9. Explain with an example of block coding method for error detection and correction. What is the Hamming distance? Find the minimum Hamming distance of the coding scheme shown in the table.
10. Explain how CRC is used in detecting errors for the following polynomial, $g(x) = x^4 + x + 1$. Consider the information sequence 1101011011. i) Find the code word corresponding to this sequence. ii) If the code word has error in third bit. What does receiver obtain when it does its error checking?
11. List the protocols for noisy channels. Explain stop and wait protocol for noiseless channels.
12. Define piggybacking and its usefulness.
13. Write explanatory notes on the different phases of PPP.
14. Explain the selective repeat and stop and wait ARQ.
15. Discuss HDLC protocol.
16. Explain briefly with neat figures stop and wait ARQ and Go back N ARQ.
17. Explain the frame format and transitional phases of point to point protocol.
18. Differentiate between character oriented protocol and bit oriented protocol frame format for framing.
19. Briefly explain about point to point protocol.
20. Explain selective repeat ARQ. Justify how selective repeat ARQ outperforms Go-Back-N and Stop-and-Wait ARQ.
21. Calculate the time takes to send 2 million bits of data in a system that uses stop and wait protocols, if the distance between sender and receiver is 2000 kms. Assume packet size is 400 bits and propagation speed is 2×10^8 m. No data or control bit is lost.
22. How does datawords and codewords is represented in block coding and also explain how can errors be selected and corrected by block coding . (June/July 2017 -10 marks)
23. Find the codeword using CRC given data is 1101 and generator is 1100. (June/July 2017 -06 marks)
24. With neat diagram, explain any two protocols of noisy Channel. (June/July 2017 -12 marks)
25. Explain the frame format of HDLC protocol. (June/July 2017 -04 marks)
26. Find the codeword at the sender site using CRC given dataword is 101001111 and generator 10111. (Dec-17/Jan 18 -05 marks)
27. Explain different frame types in HDLC. (Dec-17/Jan 18 -06 marks)
28. Explain transistion phases of PPP protocol. (Dec-17/Jan 18 -05 marks)
29. Explain with neat diagram ,simple parity check codes. (Dec-17/Jan 18 -06 marks)
30. Explain with examples, computation of internet checksum. List the steps undertaken by sender and receiver for error detection. (Dec-17/Jan 18 -05 marks)
31. Explain stop and wait protocol with appropriate diagrams. (Dec-17/Jan 18 -05 marks)
32. Define Cyclic code. Find the code word using CRC for given data word 1001 and divisor 1011. (June/July 18 -08 marks)
33. Define Frames. Explain the steps of flow control at data link layer with diagram. (June/July 18 -08 marks)
34. Explain Stop and Wait protocol with neat diagram. (June/July 18 -08 marks)
35. Explain frame structure of PPP protocol, with neat diagram. (June/July 18 -08 marks)

Module - 4

1. Describe the different controlled access methods.
2. Explain 802.3 MAC frame format and frame length.
3. Explain i) CSMA ii) CSMA/CD ii) Slotted ALOHA.
4. What do you mean by channelization? Explain the protocols used for channelization.
5. A network transmits 200 bit frame on a shared channel of 200 kbps. For aloha and slotted aloha, what is the, i) Requirement to make the frame collision free? ii) Throughput if the system produces 1000 frames/sec?
6. Define channelization and list its three protocols?
7. How does p-persistent method improve efficiency?
8. Explain why collision is an issue in a random access protocol but not in controlled access or channelizing protocols?
9. Explain any two popular control access methods, with a neat diagram.
10. Discuss the 802.11 MAC layer frame format.
11. Differentiate bus back-bone from star back bone. Explain each in detail.
12. Differentiate between amplifier and repeater.
13. Explain the IEEE 802.11 architecture.
14. How does a virtual LAN helpful in providing security and reduce the network traffic?
15. Explain the bridges.
16. Explain the hidden and exposed station problem in IEEE 802.11.
17. In brief explain blue tooth layers.
18. Bring out difference between repeaters, bridges, routers and gateways.
19. Explain the working mechanism of following devices used to connect LANs.
20. Explain the services of IEEE 802.11 standards.



21. Write a short note on: i) Bluetooth ii) cellular telephone.
22. Explain the five standards of IMT – 2000 radio – interface of 3G systems.
23. What is channelization ? List and explain channelization protocols. (June/July 2017- 12 marks)
24. Describe Gigabit Ethernet. (June/July 2017 -04 marks)
25. Describe pure ALOHA and Slotted ALOHA. (June/July 2017 -06 marks)
26. Explain Carrier Sense Multiple Access with Collision Detection. (June/July 2017 -06 marks)
27. Define Bluetooth and its architecture. (June/July 2017 -04 marks)
28. Explain the working of CSMA/CD with suitable flow diagram. (Dec-17/Jan 18 -07 marks)
29. A network using CSMA/CD has a bandwidth of 10Mbps. If the propagation time is $25.6\mu s$ what is the minimum size of the frame ? (Dec-17/Jan 18 -03 marks)
30. Define Bluetooth and explain the architecture of the same. (Dec-17/Jan 18 -06 marks)
31. Define channelization. Explain CDMA with an example. (Dec-17/Jan 18 -06 marks)
32. A pure ALOHA transmits 200 bits/frame on a shared channel of 200 Kbps. What is the throughput if the system produces 1000 frames per second? (Dec-17/Jan 18 -04 marks)
33. Discuss 802.3 MAC frame format. (Dec-17/Jan 18 -06 marks)
34. List out the Random Access protocols and explain CSMA/CD. (June/July 18 -10 marks)
35. List out channelization protocols. Explain CDMA. (June/July 18 -06 marks)
36. Explain wireless-LAN, with neat architecture and list out its characteristics. (June/July 18 -08 marks)
37. Explain the layers of Bluetooth, with neat diagram. (June/July 18 -08 marks)

Module - 5

1. What is the name of the packet in IP layer?
2. Explain Class full addressing.
3. Find the netid and hostid of the following: i) 111.64.2.6 ii) 131.57.9.3 iii) 207.64.52.11 iv) 225.34.2.1
4. What is CIDR? Explain.
5. With a neat diagram explain IPv4 format.
6. Why does the IP checksum just cover the header?
7. Explain IPv6 frame format.
8. Explain briefly the advantages of IPv6.
9. Write a note on network address translation (NAT).
10. Name and explain three types of IPv6 addresses.
11. Bring out differences between IPv4 and IPv6.
12. What strategies are devised for transition of IPV4 to IPV6?
13. Explain DHCP.
14. What is the function of ICMP?
15. Explain satellite networks and its categories. (June/July 2017 -12 marks)
16. Write a short note on Fixed WiMax. (June/July 2017 -04 marks)
17. Explain Mobile IP with phases. (June/July 2017 -12 marks)
18. Write a short note on IPV6 addressing . (June/July 2017 -04 marks)
19. Explain the operation of cellular telephony. (Dec-17/Jan 18 -06 marks)
20. Explain transition from IPV4 to IPV6. (Dec-17/Jan 18 -06 marks)
21. Discuss special addresses supported by IPV6. (Dec-17/Jan 18 -04 marks)
22. Explain IP datagram header format with neat diagram and give the description of each field. (Dec-17/Jan 18 -08 marks)
23. Explain the working of mobile IP with diagram. (Dec-17/Jan 18 -08 marks)
24. List out the difference between IPV4 and IPV6. Explain any two methods of converting IPV4 to IPV6. (June/July 18 -08 marks)
25. Explain the IP datagram, Header format, with neat diagram. (June/July 18 -08 marks)
26. Define Home address in mobile IP. Explain three phases for communication in mobile IP. (June/July 18 -08 marks)
27. Define WiMax. Explain fourth generation(4G) of cellular telephony. (June/July 18 -08 marks)

15.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by	Checked by		
Prof. Manoj Kumar A Chitale	Prof. S V Manjaragi	HOD	Principal



Subject Title	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY		
Subject Code	17CSL47	IA Marks	40
No of Lecture Hrs + Practical Hrs/ Week	01 I + 02 P	Exam Marks	60
Total No of Lecture + Practical Hrs	40	Exam Hours	03
CREDITS – 02			

FACULTY DETAILS:

Name: Mr. C. R. Belavi	Designation: Asst. Professor	Experience: 10.6 Years
No. of times course taught: 01 Time	Specialization: Computer Science and Engineering	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science and Engineering	I/II	Programming in C and Data Structures
02	Computer Science and Engineering	III	Data Structures with C
03	Computer Science and Engineering	III	OOP with C++ concepts (2014 scheme)

2.0 Course Objectives

This course will enable students to:

1. Design and implement various algorithms in JAVA.
2. Employ various design strategies for problem solving.
3. Measure and compare the performance of different algorithms.

3.0 Course Outcomes

The students should be able to:

CO	Course Outcome	Cognitive Level	POs/PSOs
C216.1	Develop Java programs to demonstrate Inheritance, Exception handling and multi-threading concepts.	L3	PO1,PO2,PO3,PO5,PO6, PO8,PO9,PO10,PO12
C216.2	Develop a Java Program to demonstrate the stack operations.	L3	PO1,PO2,PO3,PO5,PO6, PO8,PO9,PO10,PO12
C216.3	Develop the variety of algorithms using Greedy, dynamic programming and Backtracking techniques.	L3	PO1,PO2,PO3,PO5,PO6, PO8,PO9,PO10,PO12
C216.4	Analyze the performance of sorting algorithms based on divide-and-conquer technique.	L4	PO1,PO2,PO3,PO5,PO6, PO8,PO9,PO10,PO12
Total Hours of instruction			40

4.0 Course Content**Description:**

Design, develop, and implement the specified algorithms for the following problems using Java language under LINUX /Windows environment .Netbeans / Eclipse IDE tool can be used for development and demonstration.

Experiments

1.	A	Create a Java class called <i>Student</i> with the following details as variables within it. (i) USN (ii) Name (iii) Branch (iv) Phone
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		Write a Java program to create n <i>Student</i> objects and print the USN, Name, Branch, and Phone of these objects with suitable headings.
	B	Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.
2.	A	Design a superclass called <i>Staff</i> with details as StaffId, Name, Phone, and Salary. Extend this class by writing three subclasses namely <i>Teaching</i> (domain, publications), <i>Technical</i> (skills), and <i>Contract</i> (period). Write a Java program to read and display at least 3 <i>staff</i> objects of all three categories.
	B	Write a Java class called <i>Customer</i> to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using String Tokenizer class considering the delimiter character as “/”.
3.	A	Write a Java program to read two integers a and b . Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.
	B	Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.
4.		Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of $n > 5000$ and record the time taken to sort. Plot a graph of the time taken versus n on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5.		Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of $n > 5000$, and record the time taken to sort. Plot a graph of the time taken versus n on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
6.		Implement in Java, the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
7.		From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm . Write the program in Java.
8.		Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm . Use Union-Find algorithms in your program.
9.		Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm .
10.		Write Java programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm . (b) Implement Travelling Sales Person problem using Dynamic programming.
11.		Design and implement in Java to find a subset of a given set $S = \{S_1, S_2, \dots, S_n\}$ of n positive integers whose SUM is equal to a given positive integer d . For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$, there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. Display a suitable message, if the given problem instance doesn't have a solution.
12.		Design and implement in Java to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Design and Develop software applications

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Development of software applications

7.0 Books Used and Recommended to Students

Text Books



1. Introduction to the Design and Analysis of Algorithms, Anany Levitin., 2nd Edition, 2009.Pearson
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press

Reference Books

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI
2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education)

Additional Study material & e-Books

1. Lecture Notes for Algorithm Analysis and Design by Sandeep Sen
2. Introduction to the Design and Analysis of Algorithms by K. Raghava Rao

8.0**Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended****Website and Internet Contents References**

1. <http://freecomputerbooks.com/Introduction-to-Design-Analysis-of-Algorithms.html>
2. [http://www.freebookcentre.net/ComputerScience-Books-Download/Lecture-Notes-for-Algorithm-Analysis-and-Design-\(PDF-124P\).html](http://www.freebookcentre.net/ComputerScience-Books-Download/Lecture-Notes-for-Algorithm-Analysis-and-Design-(PDF-124P).html)
3. <http://www.e-booksdirectory.com/details.php?ebook=9498>

9.0**Magazines/Journals Used and Recommended to Students**

Sl.No	Magazines/Journals	website
1	Journal of Discrete Algorithms	https://www.journals.elsevier.com/journal-of-discrete-algorithms/
2	American Journal of Algorithms and Computing	http://ajac.uscip.us/
3	International Journal of Computing Algorithm (IJCOA)	https://www.ijcoa.com/
4	International Journal of Algorithms Design and Analysis	http://journalspub.com/journalspub/JournalsDetails.aspx?jid=109

10.0**Examination Note****Internal Assessment: 40 Marks**

- Continuous evaluation of each lab experiment will be done for 30 marks and its average marks will be considered.

Lab experiment conduction procedure

- A student has to perform one experiment every week.

Scheme of Evaluation for Continuous Assessment (30 Marks)

Description	Max. marks
Write-up	10
Conduction & Outcome	15
Viva-Voce	05
Total	30

Scheme of Evaluation for Internal Assessment (10 Marks)

- Lab IA will be conducted for 10 marks.

Description	Max. marks
Write-up & Conduction	05



Outcome & Conclusion	03
Viva-Voce	02
Total	10

Conduction of External Practical Examination:

1. All laboratory experiments (TWELVE nos) are to be included for practical examination.
2. Students are allowed to pick one experiment from the lot.
3. Strictly follow the instructions as printed on the cover page of answer script
4. Marks distribution: Procedure + Conduction + Viva: 15 + 70 +15 (100).
5. Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

11.0 Course Delivery Plan

Expt. No.	Lecture/ Practical No.	Experiment Name	% of portion
1	1	A. Create a Java class called <i>Student</i> with the following details as variables within it. (i) USN (ii) Name (iii) Branch (iv) Phone Write a Java program to create <i>nStudent</i> objects and print the USN, Name, Branch, and Phone of these objects with suitable headings. B. Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.	8.33
2	2	A. Design a superclass called <i>Staff</i> with details as StaffId, Name, Phone, and Salary. Extend this class by writing three subclasses namely <i>Teaching</i> (domain, publications), <i>Technical</i> (skills), and <i>Contract</i> (period). Write a Java program to read and display at least 3 <i>staff</i> objects of all three categories. B. Write a Java class called <i>Customer</i> to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as "/".	8.33
3		A. Write a Java program to read two integers <i>a</i> and <i>b</i> . Compute <i>a/b</i> and print, when <i>b</i> is not zero. Raise an exception when <i>b</i> is equal to zero. B. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.	8.33
4	4	Sort a given set of <i>n</i> integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of <i>n</i> > 5000 and record the time taken to sort. Plot a graph of the time taken versus <i>n</i> on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.	8.33
5	5	Sort a given set of <i>n</i> integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of <i>n</i> > 5000, and record the time taken to sort. Plot a graph of the time taken versus <i>n</i> on graph sheet. The elements can be read from a file or can be generated using the random	8.33



		number generator. Demonstrate using Java how the divideand- conquer method works along with its time complexity analysis: worst case, average case and best case.	
6	6	Implement in Java, the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.	8.33
7	7	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm . Write the program in Java.	8.33
8	8	Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm . Use Union-Find algorithms in your program.	8.33
9	9	Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm .	8.33
10	10	Write Java programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm . (b) Implement Travelling Sales Person problem using Dynamic programming.	8.33
11	11	Design and implement in Java to find a subset of a given set $S = \{S_1, S_2, \dots, S_n\}$ of n positive integers whose SUM is equal to a given positive integer d . For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$, there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. Display a suitable message, if the given problem instance doesn't have a solution.	8.33
12	12	Design and implement in Java to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.	8.33

12.0**QUESTION BANK**

- 1 What is an algorithm?
- 2 What is space and time efficiency?
- 3 How do you measure order of growth?
- 4 Define the Stacks and Queues.
- 5 Define graph.
- 6 Define the trees and sets.
- 7 What are Divide-and-Conquer?
- 8 What is Greedy Technique?
- 9 Explain the Heaps and Heap Sort with examples.
- 10 What is dynamic programming?
- 11 What is branch and bound?
- 12 What is binary search?
- 13 What is merge sort?
- 14 What is quick sort?
- 15 Define an array.
- 16 What is java programming?
- 17 What do you mean by multi thread application?
- 18 What is minimum cost spanning tree?
- 19 Define backtracking.
- 20 Define Hamilton cycle.

13.0**University Result**

Examination	S+	S	A	B	C	D	E	F	% Passing
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by	Checked by		
Prof. C. R. Belavi	Dr. Parashuram Baraki	HOD	Principal



Subject Title	MICROPROCESSOR AND MICROCONTROLLERS LAB		
Subject Code	17CSL48	IA Marks	40
No of Lecture Hrs + Practical Hrs/ Week	01 I + 02 P	Exam Marks	60
Total No of Lecture + Practical Hrs	40	Exam Hours	03
CREDITS – 02			

FACULTY DETAILS:

Name: N K Honnagoudar	Designation: Asst. Prof	Experience: 17 Years
No. of times course taught: 02 Time	Specialization: Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science and Engineering	I/II	Programming in C
02	Computer Science and Engineering	III	Data Structures

2.0 Course Objectives**This course will enable students to:**

- To provide practical exposure to the students on microprocessors, design and coding knowledge on 80x86 family/ARM. To give the knowledge and practical exposure on connectivity and execute of interfacing devices with 8086/ARM kit like LED displays, Keyboards, DAC/ADC, and various other devices.

3.0 Course Outcomes**The students should be able to:**

CO	Course Outcome	Cognitive Level	POs/PSOs
C217.1	Summarize 80x86 instruction sets and gains the knowledge of how assembly language works.	L1	PO1,PO2,PO3,PO4,PO5,PO8,PO9,PO10,PO12,PSo1,PSo2
C217.2	Design and implement programs written in 80x86 assembly language	L2	PO1,PO2,PO3,PO4,PO5,PO8,PO9,PO10,PO12,PSo1,PSo2
C217.3	Inter functioning of hardware devices and interfacing them to x86 family	L2	PO1,PO2,PO3,PO4,PO5,PO8,PO9,PO10,PO12,PSo1,PSo2
C217.4	Choose processors for various kinds of applications.	L2	PO1,PO2,PO3,PO4,PO5,PO8,PO9,PO10,PO12,PSo1,PSo2
Total Hours of instruction			40

4.0 Course Content**Description:**

Demonstration and Explanation hardware components and Faculty in-charge should explain 8086 architecture, pin diagram in one slot. The second slot, the Faculty in-charge should explain instruction set types/category etc. Students have to prepare a write-up on the same and include it in the Lab record and to be evaluated.

Experiments

1.	A	Design and develop an assembly language program to search a key element "X" in a list of 'n' 16-bit numbers. Adopt Binary search algorithm in your program for searching.
2.	A	Design and develop an assembly program to sort a given set of 'n' 16-bit numbers in ascending order. Adopt Bubble Sort algorithm to sort given elements.
3.	A	Develop an assembly language program to reverse a given string and verify whether it is a palindrome or not. Display the appropriate message.



4.	A	Develop an assembly language program to compute nCr using recursive procedure. Assume that 'n' and 'r' are non-negative integers
5.	A	Design and develop an assembly language program to read the current time and Date from the system and display it in the standard format on the screen.
6.	A	To write and simulate ARM assembly language programs for data transfer, arithmetic and logical operations (Demonstrate with the help of a suitable program).
7.	A	To write and simulate C Programs for ARM microprocessor using KEIL (Demonstrate with the help of a suitable program)
8.	B	a) Design and develop an assembly program to demonstrate BCD Up-Down Counter (00-99) on the Logic Controller Interface. b) Design and develop an assembly program to read the status of two 8-bit inputs (X & Y) from the Logic Controller Interface and display X*Y
9.	B	Design and develop an assembly program to display messages "FIRE" and "HELP" alternately with flickering effects on a 7-segment display interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages (Examiner does not specify these delay values nor is it necessary for the student to compute these values).
10.	B	Design and develop an assembly program to drive a Stepper Motor interface and rotate the motor in specified direction (clockwise or counter-clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).
11.	B	Design and develop an assembly language program to a) Generate the Sine Wave using DAC interface (The output of the DAC is to be displayed on the CRO). Design and develop an assembly language program to b) Generate a Half Rectified Sine waveform using the DAC interface. (The output of the DAC is to be displayed on the CRO).
12.	B	To interface LCD with ARM processor-- ARM7TDMI/LPC2148. Write and execute programs in C language for displaying text messages and numbers on LCD
13.	B	To interface Stepper motor with ARM processor-- ARM7TDMI/LPC2148. Write a program to rotate stepper motor
14.	Study Expt	Interfacing of temperature sensor with ARM freedom board (or any other ARM microprocessor board) and display temperature on LCD
15.	Study Expt	To design ARM cortex based automatic number plate recognition system
16.	Study Expt	To design ARM based power saving system

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Design and Develop software applications

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Development of software applications

7.0 Books Used and Recommended to Students

Text Books	
1.	Muhammad Ali Mazidi, Janice Gillispie Mazidi, Danny Causey, The x86 PC Assembly Language Design and Interfacing, 5th Edition, Pearson, 2013.
2.	ARM system developers guide, Andrew N Sloss, Dominic Symes and Chris Wright, Elsevier, Morgan Kaufman publishers, 2008.
Reference Books	
1.	Douglas V. Hall: Microprocessors and Interfacing, Revised 2nd Edition, TMH, 2006.
2.	K. Udaya Kumar & B.S. Umashankar : Advanced Microprocessors & IBM-PC Assembly Language Programming, TMH 2003.
Additional Study material & e-Books	

**8.0****Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended****Website and Internet Contents References**

1. <http://freecomputerbooks.com/Introduction-to-microprocessor-of-.html>

9.0**Magazines/Journals Used and Recommended to Students**

Sl.No	Magazines/Journals	website
1	Journal of microprocessor	https://www.journals.elsevier.com/journal-of-microprocessor/

10.0**Examination Note**

All laboratory experiments (all 7 + 6 nos) are to be included for practical examination.

- Students are allowed to pick one experiment from each of the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks
- PART –A: Procedure + Conduction + Viva: **08 + 35 +07 (50)**
- PART –B: Procedure + Conduction + Viva: **08 + 35 +07 (50)**
- Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

Scheme of Evaluation for Continuous Assessment (30 Marks)

Description	Max. marks
Write-up	10
Conduction & Outcome	15
Viva-Voce	05
Total	30

Scheme of Evaluation for Internal Assessment (10 Marks)

- Lab IA will be conducted for 10 marks.

Description	Max. marks
Write-up & Conduction	05
Outcome & Conclusion	03
Viva-Voce	02
Total	10

11.0**Course Delivery Plan**

Expt. No.	Lecture/ Practical No.	Experiment Name	% of portion
1	1	Design and develop an assembly language program to search a key element "X" in a list of 'n' 16-bit numbers. Adopt Binary search algorithm in your program for searching.	8.33
2	2	Design and develop an assembly program to sort a given set of 'n' 16-bit numbers in ascending order. Adopt Bubble Sort algorithm to sort given elements.	8.33
3	3	Develop an assembly language program to reverse a given string and verify whether it is a palindrome or not. Display the appropriate message.	8.33
4	4	Develop an assembly language program to compute nCr using recursive procedure. Assum	8.33



		that 'n' and 'r' are non-negative integers	
5	5	Design and develop an assembly language program to read the current time and Date from the system and display it in the standard format on the screen.	8.33
6	6	To write and simulate ARM assembly language programs for data transfer, arithmetic and logical operations (Demonstrate with the help of a suitable program).	8.33
7	7	To write and simulate C Programs for ARM microprocessor using KEIL (Demonstrate with the help of a suitable program)	8.33
8	8	a) Design and develop an assembly program to demonstrate BCD Up-Down Counter (00-99) on the Logic Controller Interface. b) Generate a Half Rectified Sine waveform using the DAC interface. (The output of the DAC is to be displayed on the CRO).	8.33
9	9	Design and develop an assembly program to display messages "FIRE" and "HELP" alternately with flickering effects on a 7-segment display interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages (Examiner does not specify these delay values nor is it necessary for the student to compute these values).	8.33
10	10	Design and develop an assembly program to drive a Stepper Motor interface and rotate the motor in specified direction (clockwise or counter-clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).	8.33
11	11	Design and develop an assembly language program to a) Generate the Sine Wave using DAC interface (The output of the DAC is to be displayed on the CRO). b) Generate a Half Rectified Sine waveform using the DAC interface. (The output of the DAC is to be displayed on the CRO).	8.33
12	12	To interface LCD with ARM processor-- ARM7TDMI/LPC2148. Write and execute programs in C language for displaying text messages and numbers on LCD	8.33
13	13	To interface Stepper motor with ARM processor-- ARM7TDMI/LPC2148. Write a program to rotate stepper motor	8.33

P12.0 QUESTION BANK

1. Define of Microprocessor?
2. Define of Microcontroller?
3. Examples for Microprocessor?
4. Examples for Microcontroller?
5. Difference between Microprocessor & Microcontroller?
6. Pin configuration of 8086 and significance of each pin?
7. Addressing modes of 8086?
8. Instruction set of 8086?
9. What are the different types of registers in ARM
10. What is flag register?
11. What is thumb instruction?
12. What are the different addressing modes of ARM

13.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by	Checked by		
Prof. N K Honnagoudar	Prof. N K Honnagoudar	HOD	Principal