	SJPN Trust's <b>Hirasugar Institute of Technology, Nidasoshi.</b> <i>Inculcating Values, Promoting Prosperity</i>	Dept. of CSE
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi Recognized under 2(f) & 12B of UGC Act, 1956	Academic Course Plan
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA:CSE & ECE	2022-23 (EVEN)

### 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.*

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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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		<b>2022-23 (EVEN)</b>

## 1.0 Student Help Desk

Sl. No.	Purpose	Contact Person	
		Faculty	Instructor
1	Research Center Coordinator ,Dept. NBA Coordinator Conference / FDP / Workshop, IIC/Internship Coordinator, NBA Criteria 1 Coordinator Module Coordinator	Dr. K. B. Manwade	Mr. A. K. Talwar
2	Website Coordinator, Feedback Coordinator, Final year seminar Coordinator, NBA Criteria 4 Coordinator NACC Criteria 3 Co-Coordinator, Module Coordinator	Dr. Mahesh. G. Huddar	Mr. A. K. Badakar
3	Dept. ED Cell Coordinator ,NBA Criteria 6 Coordinator, NAAC Criteria 1 Co-coordinator Module Coordinator, Class Teacher for VII Sem Microprocessor Lab Incharge	Prof. N K Honnagoudar	Mr. V. V. Maneshi
4	Head of Department, Innovation Club Coordinator AICTE activity point Coordinator, NBA Criteria 7 and 10 Coordinator, Module Coordinator, Project Lab Incharge	Prof. S. V. Manjaragi	Mr. A. R. Bhiste
5	GATE/Pre-placement Coaching Coordinator, Dept. T&P coordinator, NBA Criterion 9 Coordinator NACC Criterion-5 Co-Coordinator, Class Teacher for V Sem	Prof. N M Patel	Mr. A. K. Badakar
6	EMS/IA Coordinator, Alumni Coordinator, NBA Criteria 3 Coordinator, NACC Criterion-7 Co-Coordinator, Dept. Time table Coordinator / Meeting Coordinator, Module coordinator	Prof. A A Daptardar	Mr. V. V. Maneshi
7	Department Association Coordinator ( STAC), Technical magazine / Newsletter, Professional body Coordinator (IEEE/ISTE), NBA Criteria 5 Coordinator Web Programming Lab Incharge	Prof. P. G. Patil	Mr. A. K. Talwar
10	Project/KSCST Coordinator, NBA Criteria 2 Coordinator, Class Teacher for III Sem, Computer Center Lab Incharge	Prof. S. I. Mane	Mr. A. R. Bhiste
11	Dept. Library	Mr. A. R. Bhiste	
<b>Institute Level</b>			
12.	Dean Student Welfare Convener	Dr. Mahesh G. Huddar (7411043272)	
13.	Dean Placements and III Cell	Prof. N. M. Patel (9739619661)	
14.	Anti Ragging Convener	Prof. M. I. Tanodi (9611998812)	
15.	Anti Squad Convener	Prof. M. I. Tanodi (9611998812)	
16.	Internal Complaint Committee Convener	Prof. S. S. Kamte (9008696825)	
17.	Grievance Redressal Convener	Prof. S. S. Tabhaj (9901398134)	
18.	Sports & Cultural/Extra-Curricular Activities Convener	Sri. S.B. Sarawadi (9739109383)	

## 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.

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## 2.1 Faculty Position

Sl.No.	Category	No. in Position	Average experience (in years)
1.	Teaching Faculty	09	14.5
2.	Technical Supporting Staff	05	12.6
3.	Helper Staff	03	21

## 2.2 Major Laboratories

Sl.No.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested (Rs. in Lakhs)
1.	System Programming Lab.	70	12.65
2.	C Programming Lab/ Algorithms/ Network Lab.	70	19.34
3.	Project Laboratory	70	20.06
4.	Microprocessors Lab.	70	22.14
5.	Web Programming/DBA Lab.	70	09.56
6.	Computer Center	220	234.79

Total Investment in the Department

Rs. 318.54 Lakhs

## 3.0 Teaching Faculty Details

Sl. No.	Name	Designation	Qualification	Specialization	Professional Membership	Teaching Exp (in yrs)	Phone No.
1	Dr. K. B. Manwade	Assoc. Prof	M. Tech, Ph.D	CSE	LMISTE,CSI	17.06	8412968254
2	Dr. Mahesh.G. Huddar	Assoc. Prof	M. Tech, Ph.D	CSE	LMISTE	13.00	7411043272
3	Prof. N. K. Honnagoudar	Asst. Prof.	M.E	ECE	LMISTE	19.06	9449495302
4	Prof. S. V. Manjaragi	Asst. Prof.	M.Tech.(Ph.D)	CSE	LMISTE	18.06	9986658309
5	Prof. N. M. Patel	Asst. Prof	M. Tech	CSE	LMISTE	17.01	9739619661
6	Prof. A.A. Daptardar	Asst. Prof	M. Tech.	CSE	LMISTE	15.06	9620851002
7	Prof. P. G. Patil	Asst. Prof	M. Tech	CSE	LMISTE,CSI,IE	09.1	9743202717
8	Prof. Sujata Mane	Asst. Prof	M. Tech	CNE	--	8.00	9743202717
9	Prof. R A Palakar	Asst. Prof	M. Tech.	CSE	LMISTE	10.06	8660577795





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## 4.0

## Institute Academic Calendar

### CALENDAR OF EVENTS OF II & IV SEMESTER FOR THE ACADEMIC YEAR 2022-23 (Even)

Date	Events																																																		
17-05-2023 to 03-06-2023	Commencement of IV Sem Intra-inter Institutional Internship for Lateral Entry Students	<b>May -2023</b> <table border="1"> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td></td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td></tr> <tr><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr> <tr><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td></tr> <tr><td>28</td><td>29</td><td>30</td><td>31</td><td></td><td></td><td></td></tr> </table>	S	M	T	W	T	F	S			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										
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25-05-2023 to 05-06-2023	Commencement of II Sem Commencement of II Sem Classes Induction Program for II Sem																																																		
05-06-2023	Commencement of IV Sem Classes																																																		
05-06-2023	World Environmental Day																																																		
21-06-2023	International Yoga Day																																																		
01-07-2023 to 07-07-2023	Banamahostava Week																																																		
03-07-2023 to 05-07-2023	First Internal Assessment for II & IV Semester Feedback -I on Teaching-Learning	<b>June -2023</b> <table border="1"> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td></td><td></td><td></td><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr> <tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td></tr> <tr><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td></tr> <tr><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td></td></tr> </table>	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								
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08-07-2023	Display of First Internal Assessment Marks																																																		
14-07-2023	Co-curricular & Extracurricular Activities for II Sem Students																																																		
20-07-2023 to 21-07-2023	First Lab Internal Assessment for IV Sem (PCC+AEC)	<b>July -2023</b> <table border="1"> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr> <tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr> <tr><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td></tr> <tr><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td></tr> <tr><td>30</td><td>31</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	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					
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03-08-2023 to 05-08-2023	Second Internal Assessment for II & IV Semester Feedback -II on Teaching-Learning																																																		
08-08-2023	Display of Second Internal Assessment Marks																																																		
04-09-2023 to 06-09-2023	Third Internal Assessment for II Sem	<b>29-Bakrid</b> <b>Aug -2023</b> <table border="1"> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> <tr><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td></tr> <tr><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td></tr> <tr><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td></td><td></td></tr> </table>	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									
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07-09-2023 to 09-09-2023	Lab Internal Assessment for II Sem (IC)																																																		
09-09-2023	Last working day for II Semester Display of Final I.A. Marks for II Sem																																																		
11-09-2023 to 13-09-2023	Third Internal Assessment for IV Sem	<b>29-Moharam</b> <b>Sept -2023</b> <table border="1"> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td></tr> <tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr> <tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr> <tr><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td></tr> <tr><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr> </table>	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							
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14-09-2023 to 16-09-2023	Second Lab Internal Assessment for IV Sem (PCC+AEC) Lab Internal Assessment for IV Sem (IPCC)																																																		
16-09-2023	Last working day for IV Semester Display of Final I.A. Marks for IV Sem																																																		
11-09-2023 to 20-09-2023	Practical Exam/ Viva Voce for II Sem	<b>15-Independence Day</b> <b>Oct -2023</b> <table border="1"> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td></tr> <tr><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr> <tr><td>29</td><td>30</td><td>31</td><td></td><td></td><td></td><td></td></tr> </table>	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											
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19-09-2023 to 30-09-2023	Practical Exam/ Viva Voce for IV Sem																																																		
21-09-2023 to 21-10-2023	Theory Exams for II Sem	<b>19-Ganesh Chaturthi, 28-Id Milad</b> <b>2- Gandhi Jayanti</b>																																																	
03-10-2023 To 20-10-2023	Theory Exams for IV Sem																																																		
25-10-2023	Commencement of III & V Semester																																																		

Dr. R.R. Maggavi  
IQAC Coordinator

Dr. S. C. Kamate  
Principal



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Dept. of CSE


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## 6.0 Scheme of Teaching & Examination

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI												
B.E. in Computer Science and Engineering												
Scheme of Teaching and Examinations 2021												
Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)												
(Effective from the academic year 2021 - 22)												
IV SEMESTER												
Sl. No	Course and Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
				Theory Lecture	Tutorial	Practical/	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	S					
1	BSC 21CS41	Mathematical Foundations for Computing	Maths	2	2	0		03	50	50	100	3
2	IPCC 21CS42	Design and Analysis of Algorithms	Any CS Board Department	3	0	2		03	50	50	100	4
3	IPCC 21CS43	Microcontroller and Embedded SystemS		3	0	2		03	50	50	100	4
4	PCC 21CS44	Operating SystemS		2	2	0		03	50	50	100	3
5	AEC 21BE45	Biology For Engineers	BT, CHE, PHY	2	0	0		02	50	50	100	2
6	PCC 21CSL46	Python Programming Laboratory	Any CS Board Department	0	0	2		03	50	50	100	1
7	HSMC 21KSK37/47	Sanskrutika Kannada	HSMC	1	0	0		01	50	50	100	1
	HSMC 21KBK37/47	Balake Kannada										
	OR											
	HSMC 21CIP37/47	Constitution of India & Professional Ethics										
8	AEC 21CS48X/21C SL48X	Ability Enhancement Course- IV	TD and PSB: Concerned department	If offered as theory Course				01	50	50	100	1
				1	0	0						
				If offered as lab. course				02				
				0	0	2						
9	UHV 21UH49	Universal Human Values	Any Department	1	0	0		01	50	50	100	1
10	INT 21INT49	Inter/Intra Institutional Internship	Evaluation Bythe appropriate authorities	Completed during the intervening period of II and III semesters by students admitted to first year of BE./B.Tech and during the intervening period of III and IV semesters by Lateral entry students admitted to III semester.				3	100	--	100	2
<b>Total</b>									<b>550</b>	<b>450</b>	<b>1000</b>	<b>22</b>

	SJPN Trust's		Dept. of CSE
	<b>Hirasugar Institute of Technology, Nidasoshi.</b>		Academic
	<i>Inculcating Values, Promoting Prosperity</i>		Course Plan
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**Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs**

1	NCMC 21MATDIP41	Additional Mathematics - II	Maths	02	02	--	--	--	100	--	100	0
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**Note:** BSC: Basic Science Course, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, AEC –Ability Enhancement Courses, HSMC: Humanity and Social Science and Management Courses, UHV- Universal Human Value Courses. L –Lecture, T – Tutorial, P- Practical/ Drawing, S – Self Study Component, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

21KSK37/47 Samskrutika Kannada is for students who speak, read and write Kannada and 21KBK37/47 Balake Kannada is for non-Kannada speaking, reading, and writing students.

Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with Practical's of the same course. Credit for IPCC can be 04 and its Teaching – Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from practical part of IPCC shall be included in the SEE question paper. For more details the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech.) 2021-22 may be referred.

**Non – credit mandatory course (NCMC):**

**Additional Mathematics - II:**

(1) Lateral entry Diploma holders admitted to III semester of B.E./B.Tech., shall attend the classes during the IV semester to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfil the course requirements during subsequent semester/s to earn the qualifying CIE marks. These courses are slated for CIE only and has no SEE.

(2) Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

(3) Successful completion of the course Additional Mathematics II shall be indicated as satisfactory in the grade card. Non-completion of the courses

Additional Mathematics II shall be indicated as Unsatisfactory.

**Ability Enhancement Course - IV**

21CSL481	Web Programming	21CSL483	R Programming
21CS482	Unix Shell Programming	21CS484	

**Internship of 04 weeks during the intervening period of IV and V semesters; 21INT68 Innovation/ Entrepreneurship/ Societal based Internship.**

(1) All the students shall have to undergo a mandatory internship of 04 weeks during the intervening period of IV and V semesters. The internship shall be slated for CIE only and will not have SEE. The letter grade earned through CIE shall be included in the VI semester grade card. The internship shall be considered as a head of passing and shall be considered for vertical progression and for the award of degree. Those, who do not take up / complete the internship shall be considered under F (fail) grade and shall have to complete during subsequently after satisfying the internship requirements.


(2) Innovation/ Entrepreneurship Internship shall be carried out at industry, State and Central Government /Non-government organizations (NGOs), micro, small and medium enterprise (MSME), Innovation centers or Incubation centers. Innovation need not be a single major breakthrough; it can also be a series of small or incremental changes. Innovation of any kind can also happen outside of the business world.

Entrepreneurship internships offers a chance to gain hands on experience in the world of entrepreneurship and helps to learn what it takes to run a small entrepreneurial business by performing intern duties with an established company. This experience can then be applied to future business endeavours. Start-ups and small companies are a preferred place to learn the business tack ticks for future entrepreneurs as learning how a small business operates will serve the intern well when he/she manages his/her own company. Entrepreneurship acts as a catalyst to open the minds to creativity and innovation. Entrepreneurship internship can be from several sectors, including technology, small and medium-sized, and the service sector.

(3) Societal or social internship.

Urbanization is increasing on a global scale; and yet, half the world's population still resides in rural areas and is devoid of many things that urban population enjoy. Rural internship, is a work-based activity in which students will have a chance to solve/reduce the problems of the rural place for better living.

As proposed under the AICTE rural internship programme, activities under Societal or social internship, particularly in rural areas, shall be considered for 40 points under AICTE activity point programme.

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		<b>Academics</b>
		<b>Course plan</b>
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<b>Course Title</b>	<b>Mathematical Foundations for Computing Probability and Statistics</b>		
<b>Course Code</b>	21MATCS41	<b>CIE Marks</b>	50
<b>Teaching Hrs / Week (L:T:P)</b>	2:2:0	<b>SEE Marks</b>	50
<b>Total Number of Contact Hrs</b>	40	<b>Total Marks</b>	100
<b>Credits</b>	03	<b>Exam Hours</b>	03

<b>FACULTY DETAILS:</b>		
<b>Name:</b> Dr. S. L. Patil	<b>Designation:</b> Asst. Professor	<b>Experience:</b> 13.9
<b>No. of times course taught:</b> 01		<b>Specialization:</b> Mathematics

### 1.0 Prerequisite Subjects:

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

### 2.0 Course Objectives


1. Understand an intense foundational introduction to fundamental concepts in discrete mathematics.
2. Interpret, identify and solve the language associated with logical structure, sets, relations and functions, Modular arithmetic.
3. To have insight into Statistical methods, Correlation and regression analysis. Fitting of curves.
4. To develop probability distribution of discrete and continuous random variables. Joint probability distribution occurs in digital signal processing, design engineering and microwave engineering.

### 3.0 Course Outcomes

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

	<b>Course Outcome</b>	<b>POs</b>
CO1	Apply the concepts of logic for effective computation and relating problems in the Engineering domain.	1,2,3,12
CO2	Analyze the concepts of functions and relations to various fields of Engineering. Comprehend the concepts of Graph Theory for various applications of Computational Sciences.	1,2,3,12
CO3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.	1,2,3,12
CO4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the Statistical data.	1,2,3,12
CO5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.	1,2,3,12
<b>Total Hours of instruction</b>		<b>40</b>



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		<b>Academics</b>
		<b>Course plan</b>
		<b>2022-23 (EVEN Sem)</b>

## 4.0 Course Content

### Module-1 (8 Hours)

**Fundamentals of Logic:** Basic Connectives and truth tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference. Fundamentals of Logic contd.: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.

**Self Study:** Problems on Logical equivalence. (RBTL: L1, L2 and L3)

### Module-2 (8 Hours)

**Relations and Functions:** Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions. Function Composition and Inverse Functions.

**Relations:** Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions.

**Introduction to Graph Theory:** Definitions and Examples, Sub graphs, Complements, and Graph Isomorphism, Vertex degree, Euler Trails and Circuits.

**Self Study:** The Pigeon-hole Principle, problems and its applications. (RBTL: L1, L2 and L3)

### Module-3 (8 Hours)

**Statistical Methods:** Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation -problems. Regression analysis- lines of regression -problems.

**Curve Fitting:** Curve fitting by the method of least squares- fitting the curves of the form-

$$y = ax + b, y = ax^b \text{ and } y = ax^2 + bx + c$$

**Self Study:** Angle between two regression lines, problems. Fitting of the curve  $y = ab^x$  (RBTL: L1, L2 and L3)

### Module-4 (8 Hours)

**Probability Distributions:** Review of basic probability theory. Random variables (discrete and continuous), Probability mass/density functions. Mathematical expectation, mean and variance. Binomial, Poisson and normal distributions- problems (Derivations for mean and Standard Deviation for Binomial and Poisson distributions only) Illustrative examples.

**Self Study:** exponential distribution. (RBTL: L1, L2 and L3)

### Module-5 (8 Hours)

**Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation covariance and correlation.

**Sampling Theory:** Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of Hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit


**Self Study:** Point estimation and interval estimation. (RBTL: L1, L2 and L3)

## 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	Probability Distributions used to design and Analysis of algorithm, interpreting data, Machine

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	learning and artificial intelligence
02	Sampling Theory are used in design engineering, Sensors, image scanning, electricity generation & Quality of the products

## 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. Ralph P. Grimaldi and B. V. Raman, Discrete and Combinatorial Mathematics An Applied Introduction, Pearson Education, Asia, 5 <sup>th</sup> Edition-2017. ISBN 978-81-7758-424-0.
2. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44 <sup>th</sup> Edition, 2017.
Reference Books
1. Kenneth H. Rosen, Discrete Mathematics and its applications, Tata-McGraw Hill, 6 <sup>th</sup> Edition, 6 <sup>th</sup> reprint 2008. ISBN- (13): 978-0-07-064824-1.
2. C. L. Liu and D. P. Mohapatra, Elementary Discrete Mathematical Structures with Applications to Computer Science, Tata-McGraw Hill, 6 <sup>th</sup> Edition, ISBN:10:0-07-066913-9.
3. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata-McGraw Hill, 35 <sup>th</sup> reprint 2008, ISBN:13:978-0-07-463113-3.
4. Advanced Engineering, Mathematics C. Ray Wylie, Louis C. Barrett McGraw-Hill 6 <sup>th</sup> Edition 1995.
5. B.V.Ramana: "Higher Engineering Mathematics" Tata McGraw-Hill, 11 <sup>th</sup> Edition, 2010.
6. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 2014.
7. Chandrika Prasad and Reena Garg : Advanced Engineering ,Mathematics, Khanna Publishing, 2018

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

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


## 10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	+ Plus Magazine	<a href="https://plus.maths.org/issue44">https://plus.maths.org/issue44.</a>
2	Mathematics Magazine	<a href="http://www.mathematicsmagazine.com">www.mathematicsmagazine.com</a>

## 11.0 Examination Note

### Assessment Details (both CIE and SEE)

The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% ( 18 Marks out of 50) in the semester-end examination(SEE), and a minimum

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of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

#### Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour)**

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

#### Two assignments each of 10 Marks

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)**

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

**CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

#### Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module.

## 12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1	1.	Basic connectives and truth tables	20
	2.	Logical equivalence	
	3.	The laws of Logic	
	4.	Logical implication	
	5.	Rules of Inference	
	6.	Fundamentals of Logic contd.	
	7.	The use of Quantifiers & Quantifiers	
	8.	Definitions, and the Proofs of Theorems	
Module 2	9.	Cartesian Products and Relations	20
	10.	Functions – Plain and One-to-One, Onto Functions.	
	11.	Function Composition, and Inverse Functions	
	12.	Properties of Relations	
	13.	Computer Recognition – Zero-One Matrices and Directed Graphs	
	14.	Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions	



	15.	Definitions and Examples, Sub graphs, Complements, and Graph Isomorphism	
	16.	Vertex Degree, Euler Trails and Circuits	
Module 3	17.	Correlation-regression Karl Pearson's coefficient of correlation	20
	18.	rank correlation	
	19.	Problems	
	20.	Regression analysis- lines of regression (without proof) –problems	
	21.	Curve fitting by the method of least squares, of the form $y = ax + b$	
	22.	Curve fitting by the method of least squares: $y = ax^2 + bx + c$	
	23.	Problems	
	24.	Curve fitting by the method of least squares $y = ax^b$	
Module 4	25.	Random variables (discrete and continuous)	20
	26.	Probability mass/density functions	
	27.	Mathematical expectation, mean and variance of Binomial distribution.	
	28.	Problems	
	29.	Mathematical expectation, mean and variance of Poisson distribution.	
	30.	Problems	
	31.	Normal distributions.	
	32.	Problems	
Module 5	33.	Joint Probability distribution for two discrete random variables	20
	34.	Expectation, covariance and correlation	
	35.	Sampling & Sampling distributions	
	36.	standard error, test of hypothesis for means and proportions	
	37.	confidence limits for means	
	38.	Problems.	
	39.	student's t-distribution	
	40.	Chi-square distribution as a test of goodness of fit.	

## 13.0

## QUESTION BANK

### Module-1:

- Verify for any propositions  $p, q, r$  the compound proposition  $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$  is tautology or not.
- Test the validity of the following argument.  
If I study, I will not fail in the examination.  
If I do not watch TV in the evenings, I will study.  
I failed in the examination.  
∴ I must have watched TV in the evenings.
- Define converse, inverse and contra positive of a conditional.
  - Define dual of logical statement and write the dual of the statement  $(p \vee T_0) \wedge (q \vee F_0) \vee (r \wedge s \wedge T_0)$
- Prove that for any three propositions  $p, q, r$   $[(p \vee q) \rightarrow r] \Leftrightarrow [(p \rightarrow r) \wedge (q \rightarrow r)]$
- Test the validity of the following argument.  
If a triangle has 2 equal sides then it is isosceles.  
If a triangle is isosceles then it has 2 equal angles.  
A certain triangle does not have 2 equal angles.  
∴ The triangle does not have 2 equal sides.
- Give:
  - A direct proof
  - An indirect proof



iii. Proof by contradiction for the following statement.

“If  $n$  is an odd integer, then  $n + 9$  is an even integer”

7. Define the following with an example.

a) Proposition b) Tautology c) Contradiction d) Dual of Statement

8. Find the truth values of  $p$ ,  $q$  and  $r$  if

a)  $p \rightarrow (q \vee r)$  – FALSE b)  $p \wedge (q \rightarrow r)$  - TRUE

9. Give the direct proof for each of the following

a) For all integers  $k$  and  $l$ , if  $k$  and  $l$  are both even then  $k+l$  is even.

b) For all integers  $k$  and  $l$ , if  $k$  and  $l$  are both even then  $k*l$  is even.

### Module-2:

1. For any three nonempty sets  $A$ ,  $B$ ,  $C$  prove that

$$i) (A \cup B) \times C = (A \times C) \cup (B \times C) \quad ii) A \times (B \cap C) = (A \times B) \cap (A \times C)$$

2. Draw Hasse diagram representing the positive divisors of 36.

3. Let  $f: R \rightarrow R$  be defined by  $f(x) = \begin{cases} 3x - 5, & x > 0 \\ -3x + 1, & x \leq 0 \end{cases}$

4. Determine  $f(0)$ ,  $f\left(\frac{5}{3}\right)$  ii) Find  $f'([-5, 5])$ .

5. For any three nonempty sets  $A$ ,  $B$ ,  $C$  prove that

$$i) A \times (B \cup C) = (A \times B) \cup (A \times C)$$

6. ii)  $(A \times (B - C)) = (A \times B) - (A \times C)$

7. If  $f$ ,  $g$ ,  $h$  are functions from  $R$  to  $R$  defined by

$$f(x) = x^2, \quad g(x) = x + 5, \quad h(x) = \sqrt{x^2 + 2}. \text{ Then verify that } f \circ (g \circ h) = (f \circ g) \circ h.$$

8. If 30 dictionaries in a library contain total 61,327 pages then prove that at least one of the dictionaries must

have at least 2045 pages.

9. P.T if  $f: A \rightarrow B$  and  $g: B \rightarrow C$  are invertible functions, then  $g \circ f: A \rightarrow C$  is invertible and  $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$ .

10. Let  $A = \{1, 2, 3, 4, 6, 12\}$ . On  $A$  define the relation  $R$  by  $aRb$  iff ‘ $a$  divides  $b$ ’ i) prove that  $R$  is a partial order on  $A$ . ii) draw the Hasse diagram iii) write down the matrix of relation.

11. Let  $A = \{1, 2, 3, 4\}$  and  $f$  and  $g$  be functions from  $A$  to  $A$  given by  $f = \{(1, 4), (2, 1), (3, 2), (4, 3)\}$  and  $g = \{(1, 2), (2, 3), (3, 4), (4, 1)\}$ . Prove that  $f$  and  $g$  are inverses of each other.

12. Let  $f$ ,  $g$ ,  $h$  be functions from  $Z$  to  $Z$  defined by  $f(x) = x-1$ ,  $g(x) = 3x$  and  $h(x) = 0$  if  $x$  is even

1 if  $x$  is odd Determine  $(f \circ (g \circ h))$  and  $((f \circ g) \circ h)$  and verify that  $f \circ (g \circ h) = (f \circ g) \circ h$ .

13. Define the following with an examples i) Simple graph ii) Complete graph iii) Tree iv) Regular graph v) Spanning sub graph

14. Determine the whether the following graph are isomorphic or not. [Fig. Q1. (c)]

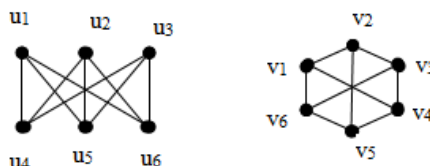


Fig. Q1. (c)

15.  $T: (V, E)$  is a complete  $m$ -ary tree with  $|V| = n$ , if  $T$  has  $l$  leaves and  $i$  internal vertex prove the following

$$\text{results: i) } n = mi + 1 \quad \text{ii) } l = (m - 1)i + 1 \quad \text{iii) } i = \frac{l-1}{m-1} = \frac{n-1}{m}$$

16. Define the following with an examples

i) Complement of graph ii) Complete bipartite graph iii) vertex degree iv) rooted tree v) Prefix code





17. Show that the following graphs are isomorphic. [Refer Fig. Q.3(a)]



Fig. Q.3. (a)

18. Prove that two simple graphs  $G_1$  and  $G_2$  are isomorphic if and only if their complements are isomorphic.  
 19. Construct an optimal prefix code for the message ROAD IS GOOD.  
 20. Prove that a tree with  $n$  vertices has  $(n - 1)$  edges.

**Module-3: Probability Distributions**

1. Find the mean & variance of Binomial distribution.  
 2. 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.

3. 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

4. Find i) The value of K, ii)  $p(x \leq 0)$ , iii)  $p(x > 1)$  iv)  $p(-2 < x \leq 1)$   
 5. If 10% of the rivets produced by a machine are defective, find the probability that, out of 12 rivets chosen at random.  
 6. 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  $p[0 \leq z \leq 1.83] = 0.4664$  &  $p[0 \leq z \leq 1.33] = 0.4082$ .  
 7. 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.  
 8. 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.  
 9. 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 ( $G T P(1)=0.3413$  )  
 10. In a certain town the duration of a shower is exponentially distributed with mean 5 minutes what is the probability that a shower will least for i) 10 minutes or more, ii) less than 10 minutes, iii) between 10 min & 12 min  
 11. The probability that a person aged 60 years will live up to 70 is 0.65. what is the probability that out of 10 persons aged 60 at least 7 of them will live up to 70.

**Module-4: Statistical Methods**

1. Find the correlation coefficient and regression lines of y and x and x and y for the following data

x	1	2	3	4	5
y	2	5	3	8	7

2. Find the coefficient of correlation for the following data.

X	10	14	18	22	26	30
Y	18	12	24	6	30	36

3. Compute the rank correlation coefficient for the following data

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70



4. Ten students got the following % of marks in two subjects x and y. Compute their rank correlation coefficient.

Marks in x	78	36	98	25	75	82	90	62	65	39
Marks in y	84	51	91	60	68	62	86	58	53	47

5. Find the equation of the best fitting straight line for the data

X	0	1	2	3	4	5
Y	9	8	24	28	26	20

6. A simply supported beam carries a concentrated load p at its midpoint corresponding to various Values of p the maximum deflection y is measured & is given below

P	100	120	140	160	180	200
Y	0.45	0.55	0.60	0.70	0.80	0.85

Find the law of the form  $y = a + bp$  & hence estimate y when  $p = 150$ .

7. Fit a second degree parabola of best fit  $y = a + bx + cx^2$

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

8. Fit a second degree parabola  $y = ax^2 + bx + c$  in the least square sense for the following data

X	0	1	2	3	4
Y	1	1.8	1.3	2.5	2.3

9. Fit a least square geometric curve  $y = ax^b$  from the following data

X	1	2	3	4	5
Y	0.5	2.0	4.5	8.0	12.5

10. The voltage v across a capacitor at time t sec is given by the following table

t	0	2	4	6	8
v	150	63	28	12	5.6

Use the method of least square of to fit a curve of the form  $v = ae^{kt}$  to this data

### Module-5: Joint Probability Distribution:

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

8. 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.
9. 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.
10. A die was thrown 1200 times & the number 6 was obtained 236 times. Can the die be considered fair at level of significance?
11. The joint probability distribution for two random variables X and Y is as given below.





	Y				
X		-2	-1	4	5
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.

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

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

13. Determine (i) Marginal distribution of X & Y (ii)  $E(X)$ ,  $E(Y)$  and  $E(XY)$  (iii)  $Cov(XY)$  (iv)  $\rho(XY)$ .
14. 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.

Prepared by	Checked by		
			
<b>Dr. S. L. Patil</b>	<b>Dr. S. L. Patil</b>	<b>HOD</b>	<b>Principal</b>

	SJPN Trust's		CSE
	<b>Hirasugar Institute of Technology, Nidasoshi.</b>		Academics
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<b>Subject Title</b>	<b>DESIGN AND ANALYSIS OF ALGORITHMS</b>		
<b>Subject Code</b>	21CS42	<b>CIE Marks</b>	50
<b>Number of Lecture Hrs / Week</b>	3:0:2:0	<b>Total Marks</b>	100
<b>Total Number of Lecture Hrs</b>	40 T + 20 P	<b>Exam Hours</b>	03
<b>CREDITS – 04</b>			

<b>FACULTY DETAILS:</b>		
<b>Name:</b> Prof. A. A. Daptardar	<b>Designation:</b> Asst. Professor	<b>Experience:</b> 17 Years
<b>No. of times course taught:</b> 04	<b>Specialization:</b> 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	RBT Level	POs
C212.1	Analyze the performance of the algorithms, state the efficiency using asymptotic notations and analyze mathematically the complexity of the algorithm.	L1, L2, L3	1,2,3,8,10,12
C212.2	Apply divide and conquer approaches and decrease and conquer approaches in solving the problems analyze the same	L1, L2, L3	1,2,3,8,10,12
C212.3	Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem.	L1, L2, L3	1,2,3,8,10,12
C212.4	Apply and analyze dynamic programming approaches to solve some problems. and improve an algorithm time efficiency by sacrificing space.	L1, L2, L3	1,2,3,8,10,12
C212.5	Apply and analyze backtracking, branch and bound methods and to describe P, NP and NP-Complete problems.	L1, L2, L3	1,2,3,8,10,12
<b>Total Hours of instruction</b>		<b>50</b>	

### 4.0 Course Content

#### Module 1 (8 Hours)

**Introduction:** What is an Algorithm? It's Properties. Algorithm Specification-using natural language, using Pseudo code convention, Fundamentals of Algorithmic Problem solving, Analysis Framework-Time efficiency and space efficiency, Worst-case, Best-case and Average case efficiency.

**Performance Analysis:** Estimating Space complexity and Time complexity of algorithms.


**Asymptotic Notations:** Big-Oh notation (O), Omega notation ( $\Omega$ ), Theta notation ( $\Theta$ ) with examples, Basic efficiency classes, Mathematical analysis of Non-Recursive and Recursive Algorithms with Examples.

**Brute force design technique:** Selection sort, sequential search, string matching algorithm with complexity Analysis.

**Textbook 1:** Chapter 1 (Sections 1.1,1.2), Chapter 2(Sections 2.1,2.2,2.3,2.4), Chapter 3(Section 3.1,3.2)

**Textbook 2:** Chapter 1(section 1.1,1.2,1.3)

*Laboratory Component:*

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1. Sort a given set of n integer elements using Selection 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. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the brute force method works along with its time complexity analysis: worst case, average case and best case.

### Module 2

(8Hours)

**Divide and Conquer:** General method, Recurrence equation for divide and conquer, solving it using Master's theorem. , Divide and Conquer algorithms and complexity Analysis of Finding the maximum & minimum, Binary search, Merge sort, Quick sort.

**Decrease and Conquer Approach:** Introduction, Insertion sort, Graph searching algorithms, Topological Sorting. It's efficiency analysis.

**Textbook 2: Chapter 3(Sections 3.1,3.3,3.4,3.5,3.6)**

**Textbook 1: Chapter 4 (Sections 4.1,4.2,4.3), Chapter 5(Section 5.1,5.2,5.3)**

#### Laboratory Component:

1. 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. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

2. 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. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

### Module 3

(8 Hours)

**Greedy Method:** General method, Coin Change Problem, Knapsack Problem, solving Job sequencing with deadlines Problems.

**Minimum cost spanning trees:** Prim's Algorithm, Kruskal's Algorithm with performance analysis.

**Single source shortest paths:** Dijkstra's Algorithm.

**Optimal Tree problem:** Huffman Trees and Codes.

**Transform and Conquer Approach:** Introduction, Heaps and Heap Sort.

**Textbook 2: Chapter 4(Sections 4.1,4.3,4.5)**

**Textbook 1: Chapter 9(Section 9.1,9.2,9.3,9.4), Chapter 6( section 6.4)**

#### Laboratory Component:

Write & Execute C++/Java Program

1. To solve Knapsack problem using Greedy method.
2. To find shortest paths to other vertices from a given vertex in a weighted connected graph, using Dijkstra's algorithm.
3. To find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.
4. To find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.

### Module 4

(8 Hours)

**Dynamic Programming:** General method with Examples, Multistage Graphs.

**Transitive Closure:** Warshall's Algorithm. **All Pairs Shortest Paths:** Floyd's Algorithm, Knapsack problem, Bellman-Ford Algorithm, Travelling Sales Person problem.

**Space-Time Tradeoffs:** Introduction, Sorting by Counting, Input Enhancement in String Matching-Harspool's algorithm.

**Textbook 2: Chapter 5 (Sections 5.1,5.2,5.4,5.9)**


**Textbook 1: Chapter 8(Sections 8.2,8.4), Chapter 7 (Sections 7.1,7.2)**

#### Laboratory Component:

Write C++/ Java programs to

1. Solve All-Pairs Shortest Paths problem using Floyd's algorithm.
2. Solve Travelling Sales Person problem using Dynamic programming.
3. Solve 0/1 Knapsack problem using Dynamic Programming method.



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### Module 5

(8 Hours)

**Backtracking:** General method, solution using back tracking to N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles Problems.

**Branch and Bound:** Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem

**NP-Complete and NP-Hard problems:** Basic concepts, non- deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.

**Textbook 1:** Chapter 12 (Sections 12.1,12.2) Chapter 11(11.3)

**Textbook 2:** Chapter 7 (Sections 7.1,7.2,7.3,7.4,7.5) Chapter 11 (Section 11.1)

#### Laboratory Component:

- Design and implement C++/Java Program 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.
- Design and implement C++/Java Program 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, 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 <sup>nd</sup> Edition, 2009.Pearson
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2 <sup>nd</sup> 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. <a href="http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS43.html">http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS43.html</a>
2. <a href="https://nptel.ac.in/courses/106/101/106101060/">https://nptel.ac.in/courses/106/101/106101060/</a>
3. <a href="http://elearning.vtu.ac.in/econtent/courses/video/FEP/ADA.html">http://elearning.vtu.ac.in/econtent/courses/video/FEP/ADA.html</a>
4. <a href="http://cse01-iiith.vlabs.ac.in/">http://cse01-iiith.vlabs.ac.in/</a>
5. <a href="http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms">http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms</a>

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## 10.0 Magazines/Journals Used and Recommended to Students

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

## 11.0 Examination Note

### Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

### Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour)**

1. First test at the end of 5<sup>th</sup> week of the semester
2. Second test at the end of the 10<sup>th</sup> week of the semester
3. Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4<sup>th</sup> week of the semester
5. Second assignment at the end of 9<sup>th</sup> week of the semester

Practical Sessions need to be assessed by appropriate rubrics and viva-voce method. This will contribute to **20 marks**.

1. Rubrics for each Experiment taken average for all Lab components – 15 Marks.
2. Viva-Voce– 5 Marks (more emphasized on demonstration topics)

The sum of three tests, two assignments, and practical sessions will be out of 100 marks and will be **scaled down to 50 marks** (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).


**CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

### Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)


1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module.

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## 12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	L1	<b>Introduction:</b> What is an Algorithm? It's Properties. Algorithm Specification-using natural language, using Pseudo code convention,	20
	L2	Fundamentals of Algorithmic Problem solving, Analysis Framework-Time efficiency and space efficiency,	
	L3	Worst-case, Best-case and Average case efficiency.	
	L4	<b>Performance Analysis:</b> Estimating Space complexity and Time complexity of algorithms.	
	L5	<b>Asymptotic Notations:</b> Big-Oh notation (O), Omega notation ( $\Omega$ ), Theta notation ( $\Theta$ ) with examples, Basic efficiency classes,	
	L6	Mathematical analysis of Non-Recursive and Recursive Algorithms with Examples.	
	L7	<b>Brute force design technique:</b> Selection sort, sequential search,	
	L8	string matching algorithm with complexity Analysis.	
	P1	1. Sort a given set of n integer elements using Selection 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. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the brute force method works along with its time complexity analysis: worst case, average case and best case.	
2	L9	<b>Divide and Conquer:</b> General method, Recurrence equation for divide and conquer,	20
	L10	solving it using Master's theorem.	
	L11	Divide and Conquer algorithms and complexity Analysis of Finding the maximum & minimum,	
	L12	Binary search, Merge sort,	
	L13	Quick sort.	
	L14	<b>Decrease and Conquer Approach:</b> Introduction, Insertion sort,	
	L15	Graph searching algorithms	
	L16	Topological Sorting. It's efficiency analysis.	
	P1-P2	1. 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. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case. 2. 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. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.	
3	L17	<b>Greedy Method:</b> General method, Coin Change Problem	20
	L18	Knapsack Problem,	
	L19	solving Job sequencing with deadlines Problems.	
	L20	<b>Minimum cost spanning trees:</b> Prim's Algorithm,	
	L21	Kruskal's Algorithm with performance analysis.	
	L22	<b>Single source shortest paths:</b> Dijkstra's Algorithm.	
	L23	<b>Optimal Tree problem:</b> Huffman Trees and Codes.	
	L24	<b>Transform and Conquer Approach:</b> Introduction, Heaps and Heap Sort.	
	P1-P4	Write & Execute C++/Java Program 1. To solve Knapsack problem using Greedy method. 2. To find shortest paths to other vertices from a given vertex in a weighted connected graph, using Dijkstra's algorithm. 3. To find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program. 4. To find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.	
4	L25	<b>Dynamic Programming:</b> General method with Examples, Multistage Graphs.	
	L26	<b>Transitive Closure:</b> Warshall's Algorithm.	
	L27	<b>All Pairs Shortest Paths:</b> Floyd's Algorithm,	
	L28	Knapsack problem	

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	L29	Bellman-Ford Algorithm,	20
	L30	Travelling Sales Person problem.	
	L31	<b>Space-Time Tradeoffs:</b> Introduction, Sorting by Counting,	
	L32	Input Enhancement in String Matching-Harspool's algorithm.	
P1-P3	Write C++/ Java programs to 1. Solve All-Pairs Shortest Paths problem using Floyd's algorithm. 2. Solve Travelling Sales Person problem using Dynamic programming. 3. Solve 0/1 Knapsack problem using Dynamic Programming method.		
5	L33	Backtracking : General method, solution using back tracking to N-Queens problem,	20
	L34	Sum of subsets problem,	
	L35	Graph coloring, Hamiltonian cycles Problems.	
	L36	<b>Branch and Bound:</b> Assignment Problem,	
	L37	Travelling Sales Person problem,	
	L38	0/1 Knapsack problem	
	L39	<b>NP-Complete and NP-Hard problems:</b> Basic concepts, non- deterministic algorithms,	
	L40	P, NP, NP-Complete, and NP-Hard classes.	
P1-P2	1. Design and implement C++/Java Program 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. 2. Design and implement C++/Java Program to find all Hamiltonian Cycles in a connected undirected Graph $G$ of $n$ vertices using backtracking principle.		

### 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 and Two	Students study the Topics and write the Answers. Get practice to solve questions	Module one & two of the syllabus	4	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 three and four of the syllabus	9	Individual Activity. Witten solutions expected.	Text book

### 14.0 QUESTION BANK

#### Module 1: Introduction

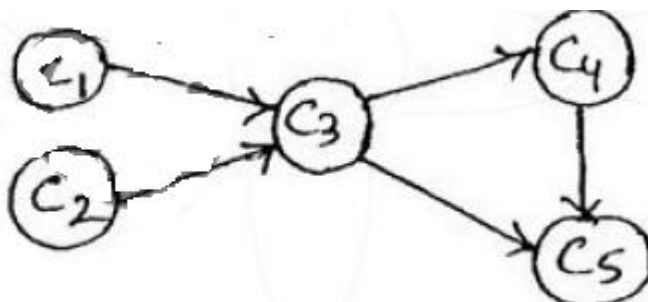
1. What is an Algorithm? What are the criteria that an algorithm must satisfy? [Dec-2018]
2. What is performance analysis? Explain time complexity and space complexity with the examples.
3. [ July-2017]
4. With the help of a flowchart, explain the various steps of algorithm design & analysis process.
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,Jun-2022]

Module 2: Divide and Conquer

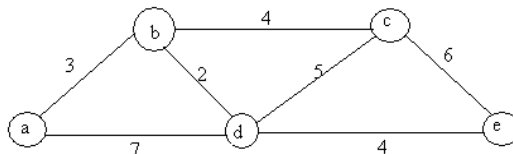
1. How do you apply divide-and-conquer technique for sorting? Write the algorithm for Merge Sort.[ July-2017]
2. Write and briefly explain the recursive binary search algorithm.[ July-2017]
3. Write Quick sort algorithm. Trace the same on data set 25, 10, 72, 18, 40, 11, 64, 58, 32, 9. [ July-2017]
4. 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]

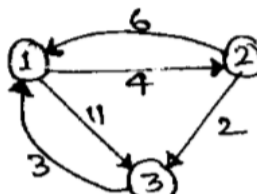
Character	A	B	C	D	_
Probabilities	0.35	0.1	0.2	0.2	0.15

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







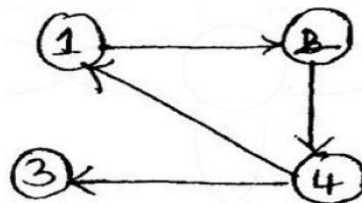
- Draw the decision tree for the 3-elements insertion sort.
- Apply Floyd's algorithm to solve the all-pairs shortest path problem for the graph whose weight matrix is given below:

0	2	$\infty$	1	8
6	0	3	2	$\infty$
$\infty$	$\infty$	0	4	$\infty$
$\infty$	$\infty$	2	0	3
3	$\infty$	$\infty$	$\infty$	0

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

0	$\infty$	3	$\infty$
2	0	$\infty$	$\infty$
$\infty$	7	0	1
6	$\infty$	$\infty$	0

- 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.
- Write Warshall's algorithm to find transitive closure.
- 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, 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.



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CSE

Academics

Course plan

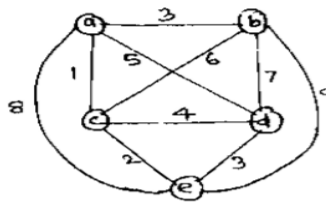
**2022-23  
(EVEN Sem)**

11. For the given nxn 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


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



## 15.0 University Result

Examination	FCD ( S, A, B )	FC ( C )	SC ( D, E )	FAIL ( F )	% Passing
June/July-2019	14	07	11	05	91.89
June/July-2020	33	10	00	00	100
June/July-2021	37	15	01	00	100
June/July-2022	20	19	18	01	98.28

Prepared by	Checked by		
Prof. A. A. Daptardar	Dr. Mahesh Huddar	HOD	Principal

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		<b>Academics</b>
		<b>Course plan</b>
		<b>2022-23 (EVEN Sem)</b>

SUBJECT TITLE		MICROCONTROLLERS AND EMBEDDED SYSTEMS	
Subject Code	21CS43	IA Marks	50
Number of Lecture Hrs	3:0:2:0	Exam Marks	50
Total Number of Lecture Hrs	40 T + 20 P	Exam Hours	03
<b>CREDITS – 04</b>			

FACULTY DETAILS:		
Name: Prof .N.K.Honnagoudar	Designation: Asst. Professor	Experience: 21
No. of times course taught:05	Specialization: Electronics	

## 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science Engineering	IV	Computer Organization

## 2.0 Course Objectives

This course will enable students to

1. Understand the fundamentals of ARM-based systems, including programming modules with registers and the CPSR .
2. Use the various instructions to program the ARM controller.
3. Program various embedded components using the embedded C program.
4. Identify various components, their purpose, and their application to the embedded system's applicability.
5. Understand the embedded system's real-time operating system and its application in IoT.

## 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	Cognitive Level	POs
C213.1	Explain C-Compilers and optimization	L1, L2,L3	1,2,3,4,6,8,12
C213.2	Describe the ARM microcontroller's architectural features and program module.	L1, L2,L3	1,2,3,4,6,8,12
C213.3	Apply the knowledge gained from programming on ARM to different applications	L1, L2,L3	1,2,3,4,6,8,12
C213.4	Program the basic hardware components and their application selection method	L1, L2,L3	1,2,3,4,6,8,12
C213.5	Demonstrate the need for a real-time operating system for embedded system applications.	L1, L2,L3	1,2,3,4,6,8,12
<b>Total Hours of instruction</b>			<b>40</b>

## 4.0 Course Content

### MODULE-I

8 Hours

Microprocessors 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 1: Chapter 1 - 1.1 to 1.4, Chapter 2 - 2.1 to 2.5

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	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA:CSE & ECE	<b>Course plan</b>
		<b>2022-23 (EVEN Sem)</b>

**Laboratory Component:** 1. Using Keil software, observe the various registers, dump, CPSR, with a simple ALP program RBT:L1,L2,L3

## MODULE-II

**8 Hours**

Introduction to the ARM Instruction Set: Data Processing Instructions, Branch Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants C Compilers and Optimization :Basic C Data Types, C Looping Structures, Register Allocation, Function Calls, Pointer Aliasing, Textbook 1: Chapter 3: Sections 3.1 to 3.6 (Excluding 3.5.2), Chapter 5 RBT:L1,L2,L3

### Laboratory Component:

1. Write a program to find the sum of the first 10 integer numbers.
2. Write a program to find the factorial of a number.
3. Write a program to add an array of 16 bit numbers and store the 32 bit result in internal RAM.
4. Write a program to find the square of a number (1 to 10) using a look-up table.
5. Write a program to find the largest or smallest number in an array of 32 numbers.

## MODULE-III

**8 Hours**

C Compilers and Optimization :Structure Arrangement, Bit-fields, Unaligned Data and Endianness, Division, Floating Point, Inline Functions and Inline Assembly, Portability Issues. ARM programming using Assembly language: Writing Assembly code, Profiling and cycle counting, instruction scheduling, Register Allocation, Conditional Execution, Looping Constructs Textbook 1: Chapter-5,6 RBT:L1,L2,L3

### Laboratory Component:

1. Write a program to arrange a series of 32 bit numbers in ascending/descending order.
2. Write a program to count the number of ones and zeros in two consecutive memory locations.
3. Display "Hello World" message using Internal UART

## MODULE-IV

**8Hours**

Embedded System Components: Embedded Vs General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, purpose of embedded systems. Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7 segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (onboard and external types), Embedded firmware, Other system components. Textbook 2: Chapter 1 (Sections 1.2 to 1.6), Chapter 2 (Sections 2.1 to 2.6) RBT:L1,L2,L3

### Laboratory Component:

1. Interface and Control a DC Motor.
2. Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
3. Determine Digital output for a given Analog input using Internal ADC of ARM controller.
4. Interface a DAC and generate Triangular and Square waveforms.
5. Interface a 4x4 keyboard and display the key code on an LCD.
6. Demonstrate the use of an external interrupt to toggle an LED On/Off.
7. Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between


## MODULE-V

**8 Hours**

RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Multiprocessing and Multitasking, Task Communication (without any program), Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques, target hardware debugging, boundary scan. Textbook 2: Chapter-10 (Sections 10.1, 10.2, 10.3, 10.4, 10.7, 10.8.1.1, 10.8.1.2, 10.8.2.2, 10.10 only), Chapter 12, Chapter-13 ( block diagram before 13.1, 13.3, 13.4, 13.5, 13.6 only) RBT:L1,L2,L3

### Laboratory Component:

1. Demonstration of IoT applications by using Arduino and Raspberry Pi

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		<b>Academics</b>
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		<b>2022-23 (EVEN Sem)</b>

## 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
03	Development of a software using Raspberry pi

## 7.0 Gap Analysis and Mitigation

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

## 8.0 Books Used and Recommended to Students

Text Books
1. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008. 2. Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education, Private Limited, 2nd Edition.
Reference Books
1. Raghu Nandan. G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 2019 2. The Insider's Guide to the ARM7 Based Microcontrollers, Hitex Ltd., 1st edition, 2005. 3. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015. 4. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008.
Additional Study material & e-Books
1. Registers: <a href="https://nptel.ac.in/courses/108/102/108102112/">https://nptel.ac.in/courses/108/102/108102112/</a> 2. Microcontrollers: <a href="https://nptel.ac.in/courses/108/105/108105132/">https://nptel.ac.in/courses/108/105/108105132/</a> 3. Embedded systems Lab: <a href="http://vlabs.iitkgp.ac.in/be/">http://vlabs.iitkgp.ac.in/be/</a> 4. Digital Electronics Lab: <a href="http://vlabs.iitkgp.ac.in/dec">http://vlabs.iitkgp.ac.in/dec</a>

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


Website and Internet Contents References
1. <a href="http://www.iitg.ac.in/apvajpevi/ph218/PH-218%20-%20Introduction.pdf">www.iitg.ac.in/apvajpevi/ph218/PH-218%20-%20Introduction.pdf</a> 2. electronics-course.com/

## 10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	IJCOT - International Journal of Computer & Organization Trends	<a href="https://www.ieee.org/documents/ieee_focus_on_computer_hardware.pdf">https://www.ieee.org/documents/ieee_focus_on_computer_hardware.pdf</a>

## 11.0 Examination Note



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Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Three Unit Tests each of 20 Marks (duration 01 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of 10 Marks

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Practical Sessions need to be assessed by appropriate rubrics and viva-voce method. This will contribute to 20 marks.

- Rubrics for each Experiment taken average for all Lab components– 15 Marks.
- Viva-Voce– 5 Marks (more emphasized on demonstration topics)

The sum of three tests, two assignments, and practical sessions will be out of 100 marks and will be scaled down to 50 marks

(to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

#### Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

The students have to answer 5 full questions, selecting one full question from each module.

## 12.0 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 and Two	Students study the Topics and write the Answers. Get practice to solve questions	Module one & two of the syllabus	4	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 three and four of the syllabus	9	Individual Activity. Witten solutions expected.	Text book



## 13.0

## Course Delivery Plan

Module	Lecture No./Practical No	Content of Lecture	% of Portion
1	L1	Microprocessors versus Microcontrollers, ARM Embedded Systems.	20
	L2	The RISC design philosophy, The ARM Design Philosophy.	
	L3	Embedded System Hardware, Embedded System Software.	
	L4	ARM Processor Fundamentals.	
	L5	Registers, Current Program Status Register.	
	L6	Pipeline, Exceptions, Interrupts.	
	L7	The Vector Table.	
	L8	Core Extensions.	
2	P1	1. Using Keil software, observe the various registers, dump, CPSR, with a simple ALP program	20
	L9	Introduction to the ARM Instruction Set.	
	L10	Data Processing Instructions.	
	L11	Branch Instructions.	
	L12	Software Interrupt Instructions, Program Status Register Instructions.	
	L13	Coprocessor Instructions, Loading Constants.	
	L14	C Compilers and Optimization :Basic C Data Types	
	L15	C Looping Structures, Register Allocation.	
	L16	Function Calls, Pointer Aliasing.	
	P2	Write a program to find the sum of the first 10 integer numbers.	
	P3	Write a program to find the factorial of a number.	
	P4	Write a program to add an array of 16 bit numbers and store the 32 bit result in internal RAM.	
3	P5	Write a program to find the square of a number (1 to 10) using a look-up table.	20
	P6	Write a program to find the largest or smallest number in an array of 32 numbers.	
	L17	C Compilers and Optimization :Structure Arrangement, Bit-fields.	
	L18	Unaligned Data and Endianness, Division, Floating Point.	
	L19	Inline Functions and Inline Assembly, Portability Issues.	
	L20	ARM programming using Assembly language.	
	L21	Writing Assembly code, Profiling and cycle counting.	
	L22	instruction scheduling, Register Allocation.	
4	L23	Conditional Execution.	20
	L24	Looping Constructs.	
4	P7	Write a program to arrange a series of 32 bit numbers in ascending/descending order.	20
	P8	Write a program to count the number of ones and zeros in two consecutive memory locations.	
	P9	Display "Hello World" message using Internal UART	
	L25	Embedded System Components: Embedded Vs General computing system.	
	L26	History of embedded systems, Classification of Embedded systems.	
	L27	Major applications areas of embedded systems.	
	L28	purpose of embedded systems.	
	L29	Core of an Embedded System including all types of processor/controller.	
	L30	Memory, Sensors, Actuators.	
	L31	LED, 7 segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (onboard and external types).	
4	L32	Embedded firmware, Other system components.	20
	P9	Interface and Control a DC Motor.	
4	P10	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.	20

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		<b>2022-23 (EVEN Sem)</b>

	P11	Determine Digital output for a given Analog input using Internal ADC of ARM controller.	
	P12	Interface a DAC and generate Triangular and Square waveforms.	
	P13	Interface a 4x4 keyboard and display the key code on an LCD.	
	P14	Demonstrate the use of an external interrupt to toggle an LED On/Off.	
	P15	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.	
5	L33	RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems.	20
	L34	Task, process and threads (Only POSIX Threads with an example program).	
	L35	Thread preemption, Multiprocessing and Multitasking, Task Communication (without any program), Task synchronization issues.	
	L36	Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program).	
	L37	How to choose an RTOS, Integration and testing of Embedded hardware and firmware.	
	L38	Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler.	
	L39	simulator, emulator and debugging techniques.	
	L40	target hardware debugging, boundary scan.	
	P16	Demonstration of IoT applications by using Arduino and Raspberry Pi.	

## 14.0 QUESTION BANK

### MODULE-1: Microprocessors versus Microcontrollers, ARM Embedded Systems .

1. What is microcontroller and explain.( JAN 2019)
2. Differentiate between microprocessor and micro controllers. .( JAN 2020)
3. Explain different instruction sets of microcontrollers. .( AUG 2021)
4. Explain ARM processors
5. Draw and explain Arm Processor Model. .( JAN 2022)
6. Explain different processor modes of ARM processor. .( AUG 2020)
7. List the vector address of various interrupts.
8. Explain about memorymanagement in ARM Processors. .( JAN 2020)
9. Explain about combined cache and Tightly coupled memory.( AUG2019)
10. Explain condition flag of ARM processor. .( JAN 2021)

### MODULE-2: Introduction to the ARM Instruction Set: Data Processing Instructions.


1. Explain data types supported by ARM processor.. .( JAN 2020)
2. Explain barrel shift with neat diagram.( AUG 2021)
3. Explain 5 different shift operations that can be used with barrel shifter..( JAN 2022)
4. Briefly Explain any 5 arithmetic operations..( AUG 2020)
5. Explain the following instructions set, i) MOV ii) ADD iii) SUB iv) CMP (JAN 2022).
6. Write an ALP to find 1's compliment of a number.( JAN 2020)
7. Write an ALP to find larger of a number.( AUG2019)
8. Write an ALP to add series of 16 bit numbers stored in a array.( JAN 2021)

### MODULE-3: C Compilers and Optimization .

1. Explain difference between compiler and cross compiler. .( JAN 2021)
2. Explain ROM,EEPROM and EPROM (AUG 2021)
3. Explain 5 different shift operations that can be used with barrel shifter..( JAN 2022)
4. Write block diagram of stepper motor and explain.( AUG 2020)
5. Explain C language and embedded C (JAN 2022).
6. Write an ALP to find stepper motor to rotate clockwise and anticlockwise.( JAN 2020)
7. Write an ALP to find LED turn ON/OFF.( AUG2019)
8. Write an ALP to add series of 32 bit numbers stored in a array.( JAN 2022)

### MODULE-4: Embedded System Components.

1. What is DRAM and SRAM.( JAN 2020)

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2. Explain with block diagram sensor components.( JAN 2021)
3. Explain about ADC and DAC with diagrams.( AUG2022)
4. Describe blue tooth and WI-Pi.( JAN 2022)
5. Explain about Embedded firmware.( JAN 2021)
6. Write an ALP of d.c motor rotation.( JAN 2020)
7. Write an ALP Seven segment LED display.( JAN 2020)
8. Write an ALP of DAC( JAN 2022)


#### MODULE-5: RTOS and IDE for Embedded System Design.

1. Explain characteristics of real time operating system..( JAN 2021)
2. Explain about types of operating systems. ( AUG 2020)
3. What is thread and process explain with examples. ( JAN 2021)
4. Explain about multiprocessing and multitasking. ( AUG2019)
5. Explain about Semaphores. ( AUG2021)
6. Explain about disassembler and decompilers.(JAN 2020)
7. Write a program of a binary semaphore in RTOS.( AUG2021)
8. Explain about simulator and Emulator.( JAN 2019/ AUG2020)

### 15.0 University Result

Examination	FCD	FC	SC	FAIL	% Passing
JULY 2022	09	22	23	04	93.10

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

	SJPN Trust's		<b>CSE</b>
	<b>Hirasugar Institute of Technology, Nidasoshi.</b>		<b>Academics</b>
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SUBJECT TITLE	OPERATING SYSTEMS		
Subject Code	21CS44	CIA Marks	50
		SEE Marks	50
Number of Lecture Hrs / Week	04	Total Marks	100
Total Number of Lecture Hrs	40	Exam Hours	03
Credits: 03			

FACULTY DETAILS:		
Name: Dr. Mahesh Huddar	Designation: Associate Professor	Experience: 14 Years
No. of times course taught: 02	Specialization: Computer Science & Engineering	

## 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science	I/II	CPS
02	Computer Science	III	DSA

## 2.0 Course Objectives

1. Introduce concepts and terminology used in OS
2. Explain threading and multithreaded systems
3. Illustrate process synchronization and concept of Deadlock
4. Introduce Memory and Virtual memory management, File system and storage techniques.

## 3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	POs/PSOs
C214.1	Demonstrate need for Operating System and its types.	L2	PO-1,2,3,4,7,10, PSO1, PSO2
C214.2	Explain the multithreaded systems and scheduling algorithms.	L2	PO-1,2,3,4,7,10, PSO1, PSO2
C214.3	Illustrate the concept of process synchronization and Deadlock.	L2	PO-1,2,3,4,7,10, PSO1, PSO2
C214.4	Explain the concept of memory management and File System.	L2	PO-1,2,3,4,7,10, PSO1, PSO2
C214.5	Illustrate the different concepts of disk management, Protection and Linux System case studies.	L2	PO-1,2,3,4,7,10, PSO1, PSO2
<b>Total Hours of instruction</b>			<b>40</b>

## 4.0 Course Content

Module-1

**08Hours**


**Introduction to operating systems, System structures:** What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments.

**Operating System Services:** User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.

**Process Management:** Process concept; Process scheduling; Operations on processes; Inter process communication

**Text book 1: Chapter 1, 2, 3**



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	<b>Hirasugar Institute of Technology, Nidasoshi.</b>	<b>Academics</b>
	<i>Inculcating Values, Promoting Prosperity</i>	<b>Course Plan</b>
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<b>Accredited at 'A' Grade by NAAC &amp; Programmes Accredited by NBA:CSE &amp;ECE</b>		

#### Module – 2

**08 Hours**

**Multi-threaded Programming:** Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling.

**Process Synchronization: Synchronization:** The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

**Text book 1: Chapter 4,5**

#### Module – 3

**08 Hours**

**Deadlocks: Deadlocks;** System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

**Memory Management:** Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.

**Text book 1: Chapter 7, 8**

#### Module – 4

**08 Hours**

**Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

**File System, Implementation of File System:** File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.

**Text book 1: Chapter 9, 10, 11**

#### Module – 5

**08 Hours**

**Secondary Storage Structures, Protection:** Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems.

**Case Study: The Linux Operating System:** Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.

**Text book 1: Chapter 12, 21**

### 5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VI	System Software Lab	
02	VIII	Project Work	

### 6.0 Relevance to Real World


Sl. No	Real World Mapping
01	Project Development

### 7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: MODULE – I TO MODULE-V
02	NPTEL	Videos

### 8.0 Books Used and Recommended to Students

Text Books
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7 <sup>th</sup> edition, Wiley-India, 2006.
Reference Books

	S J P N Trust's <b>Hirasugar Institute of Technology, Nidasoshi.</b> <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi Recognized under 2(f) & 12B of UGC Act, 1956 <b>Accredited at 'A' Grade by NAAC &amp; Programmes Accredited by NBA:CSE &amp;ECE</b>	<b>Dept. of CSE</b>
		<b>Academics</b>
		<b>Course Plan</b>
		<b>2022-23 EVEN</b>

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6<sup>th</sup> Edition
2. D.M Dhamdhare, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

#### Additional Study material & e-Books

Notes and Videos

## 9.0

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

#### Website and Internet Contents References

- 1) <https://youtu.be/xcCM11ChT38>

## 10.0

### Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	UX Magazines	<a href="https://uxmag.com/topics/operating-systems">https://uxmag.com/topics/operating-systems</a>
2	STM Journal	<a href="http://stmjournals.com/Journal-of-Operating-Systems-velopment-and-Trends.html">stmjournals.com/Journal-of-Operating-Systems-velopment-and-Trends.html</a>

## 11.0

### Examination Note

#### Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

#### Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour)**

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)**

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

**CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

#### Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.


The students have to answer 5 full questions, selecting one full question from each module.



## 2.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	What operating systems do; Computer System organization;	20
	2	Computer System architecture; Operating System structure; Operating System operations;	
	3	Process management; Memory management; Storage management; Protection and security; Distributed system;	
	4	Special-purpose systems; Computing environments. Operating System Services; User – Operating System interface;	
	5	System calls; Types of system calls;	
	6	System programs; Operating System design and implementation;	
	7	Operating System structure; Virtual machines; Operating System generation; System boot.	
	8	Process concept; Process scheduling. Operations on processes; Inter-process communication.	
2	9	Multi-Threaded Programming: Overview; Multithreading models;	20
	10	Thread Libraries; threading issues.	
	11	Process Scheduling: Basic concepts; Scheduling criteria;	
	12	Scheduling algorithms;	
	13	Multiple-Processor scheduling; Thread scheduling.	
	14	Synchronization;	
	15	The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores;	
	16	Classical problems of synchronization; Monitors.	
3	17	Deadlocks: System model;	20
	18	Deadlock characterization;	
	19	Methods for handling deadlocks;	
	20	Deadlock prevention;	
	21	Deadlock avoidance;	
	22	Deadlock detection and recovery from deadlock.	
	23	Memory Management Strategies: Background; Swapping; Contiguous memory allocation;	
	24	Paging; Structure of page table; Segmentation.	
4	25	Virtual Memory Management: Background; Demand paging;	20
	26	Copy-on-write;	
	27	Page replacement;	
	28	Allocation of frames; Thrashing.	
	29	File System: File concept; Access methods;	
	30	Directory structure	
	31	File system mounting; File sharing; Protection. Implementing File System: File system structure;	
	32	File system implementation; Directory implementation; Allocation methods; Free space management.	
5	33	Mass storage structures; Disk structure; Disk attachment;	20
	34	Disk scheduling; Disk management; Swap space management.	
	35	Protection: Goals of protection, Principles of protection, Domain of protection,	
	36	Access matrix, Implementation of access matrix,	
	37	Access control, Revocation of access rights, Capability-Based systems.	
	38	Linux history; Design principles;	
	39	Kernel modules; Process management; Scheduling; Memory management;	
	40	File systems, Input and output; Inter-process communication.	

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

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		<b>Academics</b>
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		<b>2022-23 EVEN</b>

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 practico to solve questions.	Module 1 and 2 of the syllabus	4	Individual Activity. Witten solutions expected.	Text book 1 and reference books
2	Assignment 2: Some important University Questions on Module two	Students study the Topics and write the Answers. Get practice to solve questions.	Module 3 and 4 of the syllabus	9	Individual Activity. Witten solutions expected.	Text book 1 and reference books
3	Group discussion/Seminar/quiz	Group discussion/Seminar/quiz	Module 5 of the syllabus	13	Individual Activity	Text book 1 and reference books

## 14.0 QUESTION BANK

### MODULE – 1

1. Define operating system. With a neat diagram, explain the dual mode operation of OS. (Jun-2018)
2. Explain the role operating system with user & viewpoints.
3. Explain the services of operating system that are helpful for user and the system. (Jun-2018)
4. List the operating system responsibilities in connection with a process management and memory management.
5. Explain the following terms.  
i) Virtual Machine ii) CPU Scheduler iii) System Call iv) Context Switch (Jun-2018)
6. Explain types of multiprocessors systems and type of clustering. What is fault tolerant system?
7. Give the features of symmetric & asymmetric multiprocessor system.
8. Explain the graceful degradation and „fault tolerant“ in a multiprocessor system.
9. Explain two sets of operating system services that are helpful to the user as well as efficient operation of the system.
10. Briefly explain the common classes of services provided by the various operating systems for helping the user and for ensuring the efficient operation of the system.
11. Write and explain the sequence of system calls for copying a file to another(new) file.
12. Explain the layered approach of operating system structure, with supporting diagram. (Jun-2018)
13. What are virtual machines? Explain the advantages with neat diagram.
14. What are the essential properties of batch, real time and distributed operating systems.
15. Explain the concept of virtual machine. Bring out its advantages.
16. Differentiate between trap and interrupt.
17. What are virtual machines? How are they implemented?
18. What are the ways in which threads terminates?
19. With the help of an example, explain the concept of virtual machines.
20. Distinguish among the following terminologies associated with the operating system and explain each of them in detail. Multi programming systems, Multitasking systems and Multiprocessor systems.
21. What is process? Draw and explain the process state diagram. (Jun-2018)
22. Differentiate between process and thread, short term and medium term schedules, user level and kernel level threads and waiting and turnaround time.
23. Describe operations an OS takes to context switch between processes.
24. What is PCB? Enumerate and explain various fields in PCB.
25. Discuss the operations of process creation and process termination in UNIX.
26. What is interprocess communication? Explain direct and indirect communication with respect to Message passing system. (Jun-2018)
27. Discuss the implementation of IPC using shared memory and message passing.
28. Distinguish between the following pairs of terms:
  - i. Symmetric and Asymmetric multiprocessor systems
  - ii. CPU burst and I/O burst Jobs



- iii. User view and System view of OS
- iv. Batch systems and Time Sharing System
- v. User Mode and Kernel mode operations

## MODULE – 2

1. Differentiate between user level thread & kernel level thread and process & Thread.
2. Write a note on multithreaded models. What are the benefits of multithreaded programming?(Jun-2018)
3. List out the threading issues & Explain.
4. Define the five scheduling criteria considered in process management.
5. Consider 4 jobs with (arrival time, burst time) as (0, 5) (0.2, 2) (0.6, 8) (1.2, 4). Find the average turnaround time and waiting time for the jobs using FCFS, SJF and RR(q=1) scheduling algorithms.
6. Consider the following set of processes.

Process	Arrival Time	Burst Time
P1	0	1
P2	1	9
P3	2	1
P4	3	9

- a) Draw Gantt charts showing the execution of these processes using FCFS, preemptive SJF, non-pre-emptive SJF and RR (Quantum 1) scheduling schemes.
- b) Compute the turnaround time and waiting time for each process for each of the schemes above.
- c) Compute the average turnaround time and average waiting time in each scheme and thus
- d) Find the best scheme in this particular case.
7. Why thread is called LWP? Describe any one threading model.
8. Write an algorithm for producer problem with a bounded buffer explains the race condition problem.
9. Define race condition. Explain reader's Writer's problem with semaphores.
10. Define race condition. List the requirements that a solution to the critical problem must satisfy.
11. What is critical section problem? What are the three requirements to be met by a solution to the critical section problem? (Jun-2018)
12. Explain Peterson's solution to the critical section problem. (Jun-2018)
13. Define an algorithm Test And Set ( ) & Swap( ). Show that they satisfy mutual exclusion.
14. What is synchronization? Explain synchronization hardware.
15. What are semaphores? Explain two preemptive semaphore operations. What are the advantages of semaphores?
16. What are the types of semaphores? Explain any three uses of semaphores.
17. What are semaphores? Explain the solution to producer-consumer problem using semaphores.
18. How the semaphores are implemented?
19. Describe the bounded buffer problem & give the solution for the same using semaphores.
20. Write the structure of producer & consumer processes.
21. Describe the reader & writer problem & give a solution for the same using semaphores. Write the structure of reader & writer processes.
22. Explain the dining philosopher problem with Semaphores. (Jun-2018)
23. What is monitor? Write the monitor solution for the dining philosopher problem.
24. Explain the syntax and schematic view of monitors. (Jun-2018)
25. Describe the following: i) Semaphore ii) wait( ) operation iii) signal( ) operation

## MODULE – 3

1. What is a deadlock? Explain the necessary conditions for its occurrence. (Jun-2018)
2. Explain how Resource-Allocation graphs are used to describe deadlocks.
3. Write a note on deadlock prevention.
4. What are the methods available for handling deadlocks? Explain Banker's algorithm.
5. Deadlock occurs if cycle exists. Justify your answers.
6. For the following information find the safe sequence using Banker's algorithm, the number of resources for R1, R2, R3 are 7, 7, 10 respectively.

Process	Allocated resources			Maximum Requirements		
	R1	R2	R3			
P1	2	2	3	3	6	8
P2	2	0	3	4	3	3
P3	1	2	4	3	3	4





7. Describe Banker's algorithms for deadlock avoidance
8. Write note on deadlock detection.
9. List any four examples of deadlock that are related to computer systems.
10. Discuss the various approaches used for deadlock recovery.
11. Write a note on dynamic Loading and Linking.
12. What is swapping? Does this increase OS overhead? Justify your answer.
13. What is locality of reference? Differentiate between paging and segmentation.
14. Write a note on Contiguous memory allocation.
15. What do you mean by dynamic storage allocation problem? Explain possible solutions to this problem.
16. What is internal & external fragmentation?
17. Bring out differences between internal & external fragmentation? How are they overcome?
18. Explain the buddy-system, used for managing free memory assigned to kernel process.
19. What is paging? Explain paging hardware with translation look-aside buffer. (Jun-2018)
20. Why TLB is important. In simple paging what information is stored in TLB.
21. Write a note on shared pages.
22. Explain the hierarchical, Hashed and inverted paging technique for structuring the page table. (Jun-2018)
23. Describe the Segmentation technique.
24. Given 5 memory partitions 100KB, 500KB, 200KB, 300KB and 600KB, how each of the first fit, best fit and worst fit algorithms place processes of 212KB, 417KB, 112KB and 426KB size. Which algorithm makes efficient use of memory? (Jun-2018)

#### MODULE – 4

1. Describe the demand paging system.
2. What is paging and swapping?
3. What is Page Fault? Discuss the steps involved in handling the page fault with diagram. (Jun-2018)
4. What is thrashing explain.
5. Explain the concept of forward-mapped page table.
6. Let the user process size be 1MB & the data transfer rate from memory to disk be 5MB per second. Determine the time required for the program data transfer to disk from memory. If the average latency is 8 msec, determine the total swapping time.
7. Explain internal and external fragmentation with a neat diagram.
8. Consider the following page reference string. 1, 2, 3, 5, 2, 3, 5, 7, 2, 1, 2, 3, 8, 6, 4, 3, 2, 2, 3, 6. How many page faults would occur in the case of i) LRU ii) FIFO iii) Optimal algorithms assuming 3 frames.  
Note that initially all frames are empty.
9. Given the memory partitions 100K, 500K, 200K, 300K and 600K, apply the first and best fit algorithms to place, 212K, 417k, 112K and 426K in memory.
10. For the following page reference calculate the page faults that occur using FIFO and LRU for 3 and 4 page frames respectively. 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5.
11. Consider the following page reference stream: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 3, 3, 6. How many page faults would occur for LRU, FIFO and optimal replacement algorithms assuming 3 and 5 frames? Which one of the above is most efficient?
12. A hypothetical main memory can store only 3 frames simultaneously. The sequence in which the pages will be required is given below : 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. Indicate the sequence in which the three frames will be filled in i) FIFO ii) Optimal Page Replacement iii) Least Recently Used methods of page replacement. Indicate the number of page faults in each case. (Jun-2018)
13. Explain copy-on-write process in virtual memory. (Jun-2018)
14. What is file? Describe different access modes on files.
15. Discuss the following in brief i) File attributes ii) File types iii) Sequential file access iv) Tree structured directory structure.
16. List the common file types along with its extensions and functions.
17. List the different directory structure. Explain acyclic – graph directory and tree structured directory. (Jun-2018)
18. Explain different storage methods available for storing file, with neat diagram.
19. Explain the Single, two, tree level, acyclic graph and general graph directory structure.
20. What are directories? Explain File mounting.
21. What is a file? Also list different file operations. (Jun-2018)
22. Write a note on Directory implementation



23. Discuss the Contiguous allocation of disk space.
24. Explain different disk space allocation methods with an example. (Jun-2018)
25. Discuss the Linked allocation of disk space. Is FAT link file allocation? Discuss.
26. Discuss the Indexed allocation of disk space.
27. Write a note on free-space management.
28. Briefly explain the methods of keeping tracks of free space on disks.
29. How do the modern operating systems concurrently support multiple types of file system?  
Explain its implementation, in detail.


**MODULE – 5**

1. Explain the FCFS, SSTF, SCAN, C-SCAN, LOOK and C-LOOK disk scheduling algorithm in brief with example.
2. Explain sector slipping, with an example.
3. Describe the access matrix model for protection purpose.
4. Suppose the portion of cylinder is at 53. Sketch the graphical representation for the queue of pending requests in the order- 98, 183, 37, 122, 14, 124, 65, 67 for FCFS, SSTF and LOOK scheduling schemes. Give your comment on this scenario in a computer system. (Jun-2018).
5. Suppose a disk drive has 5000 cylinders numbered 0 to 4999. Drive is currently serving request at cylinder 143, and previous request was at cylinder 125, queue of pending requests in FIFO order is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all pending request for FCFS, SSTF, LOOK, SCAN disk scheduling algorithms.
6. What is an access matrix? Explain the different methods of implementing access matrix. (Jun-2018)
7. Explain bad-block recovery in disk. (Jun-2018)
8. Write a short note on swap space management and revocation of access rights.
9. Explain the various questions that arise in Revocation of access rights.
10. What are the components of Linux System?
11. What are the parts included in Process Context.
12. Distinguish between fork( ) and clone( ) system call. Also customize the clone( ) system call to fork( ) functionality, with suitable modifications/settings.
13. Explain the Process scheduling in Linux System.
14. Write a note on Kernel Synchronization and memory management.
15. Explain process management in Linux. (Jun-2018)
16. Explain the Linux device drive the block structure.
17. What are design principles of Linux OS? Explain. (Jun-2018)
18. What do you mean by cloning? How it is achieved in Linux systems.
19. How IPC is handled in Linux? Explain with an example. (Jun-2018)
20. Differentiate between static & dynamic linking.
21. Explain Linux file system.
22. Write a note on Linux security model.
23. How does Linux manage authentication and access control mechanisms?
24. Write short notes on:
  - a. Components of a Linux system
  - b. Inter process communication
  - c. Thrashing
  - d. Monitors

**14.0 University Result**

Examination	FCD	FC	SC	Fail	% Passing
June/July-2022	08	20	27	03	94.83
July/Aug-2021	42	10	01	00	100
Aug/Sep 2020	31	12	00	00	100

Prepared by	Checked by		
<b>Dr. Mahesh Huddar</b>	<b>Prof. A. A. Daptardar</b>	<b>HOD</b>	<b>Principal</b>

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		<b>Academics</b>
		<b>Course Plan</b>
		<b>2022-23 EVEN</b>

<b>Subject Title</b>	<b>Biology for Engineers</b>		
Subject Code	21BE45	CIA Marks	50
Number of Lecture Hrs / Week (L:T:P: S)	1:2:0:0 / 2:0:0:0	SEE Marks	50
Total Number of Lecture Hrs	25	Exam Hours	02
<b>CREDITS – 02</b>			

<b>FACULTY DETAILS:</b>		
<b>Name:</b> Sri.V. M. Bhumannavar	<b>Designation:</b> Asst. Professor	<b>Experience:</b> 1) 18 Years
<b>No. of times course taught:</b> 01		<b>Specialization:</b> Spectroscopy

### 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	All Branch (Common)	IV	Fundamentals of Biology

### 2.0 Course Objectives

This course (21BE45) will enable students

1. To familiarize the students with the basic biological concepts and their engineering applications.
2. To enable the students with an understanding of biodesign principles to create novel devices and structures.
3. To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.

### 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	Cognitive Level	POs
C105.1	Elucidate the basic biological concepts via relevant industrial applications and case studies.	L1,L2	1,8,12
C105.2	Evaluate the principles of design and development, for exploring novel bioengineering projects.	L1,L2	1,,8,12
C105.3	Corroborate the concepts of biomimetics for specific requirements.	L1,L2	1, 8,12
C105.4	Think critically towards exploring innovative biobased solutions for socially relevant problems.	L1,L2	1,8,12
C105.5	Future Trends in Bioengineering	L1,L2	1,8,12
<b>Total Hours of instruction</b>		<b>25 Hours</b>	


### 4.0 Course Content

#### MODULE-1

**05 Hours**

#### BIOMOLECULES AND THEIR APPLICATIONS (QUALITATIVE):

Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics), Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19, Forensics – DNA fingerprinting), Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins), lipids (biodiesel, cleaning agents/detergents), Enzymes (glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching).

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## MODULE-2

05 Hours

### HUMAN ORGAN SYSTEMS AND BIO DESIGNS - 1 (QUALITATIVE):

Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease). Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye). Heart as a pump system (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators).

## MODULE-3

05 Hours

### HUMAN ORGAN SYSTEMS AND BIO-DESIGNS - 2 (QUALITATIVE):

Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine). Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems). Muscular and Skeletal Systems as scaffolds (architecture, mechanisms, bioengineering solutions for muscular dystrophy and osteoporosis).

## MODULE-4

05 Hours

### NATURE-BIOINSPIRED MATERIALS AND MECHANISMS (QUALITATIVE):

Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perfluorocarbons (PFCs).

## MODULE-5

05 Hours

### TRENDS IN BIOENGINEERING (QUALITATIVE):

Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D printed foods. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Self-healing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).

## 5.0 Relevance to future subjects


Sl No	Semester	Subject	Topics
01	Higher Semester	Information regarding Biology for Engineers	Basic fundamentals

## 6.0 Relevance to Real World

SL.No	Real World Mapping
01	Brain as a CPU system
02	Nucleic acids (DNA Vaccine for Rabies)
03	Nucleic acids (RNA vaccines for Covid19)
04	Nucleic acids (Forensics – DNA fingerprinting)
05	Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine).

## 7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Chalk and Talk	This delivery method is adapted to all modules.

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02	Self prepared PPTs	The PPTs are also used in the discussions wherever necessary in the syllabus.
03	Self Prepared videos	Self prepared videos are also used for better understanding.
04	Experimental Demonstration	Experimental Demonstration is done to the students for better understanding of concepts.
05	Tutorial	Topic: Module I to Module V
06	NPTEL	Biology for Engineers Videos

## 8.0 Books Used and Recommended to Students

### Suggested Text Books

#### Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)


- Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
- Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
- Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
- Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
- Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
- Biomimetics: Nature-Based Innovation, [Yoseph Bar-Cohen](#), 1st edition, 2012, CRC Press.
- Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
- Bioremediation of heavy metals: bacterial participation, by [C R Sunilkumar, N Geetha A C Udayashankar](#) Lambert Academic Publishing, 2019.
- 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
- Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016
- Blood Substitutes, Robert Winslow, Elsevier, 2005

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

- VTU EDUSAT / SWAYAM / NPTEL / MOOCS / Coursera / MIT-open learning resource
- <https://nptel.ac.in/courses/121106008>
- <https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists>
- <https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009>
- <https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006>
- <https://www.coursera.org/courses?query=biology>
- [https://onlinecourses.nptel.ac.in/noc19\\_ge31/preview](https://onlinecourses.nptel.ac.in/noc19_ge31/preview)
- <https://www.classcentral.com/subject/biology>
- <https://www.futurelearn.com/courses/biology-basic-concepts>

## 10.0 Activity Based Learning (Suggested Activities in Class)/ Practical Based learning



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Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Group Discussion of Case studies
2. Model Making and seminar/poster presentations
3. Design of novel device/equipment like Cellulose-based water filters, Filtration system mimicking the kidney, Bioremediation unit for E-waste management, AI and ML based Bioimaging,

## 11.0 Examination Note

### Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

### Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour)**

- First test at the end of 5<sup>th</sup> week of the semester
- Second test at the end of the 10<sup>th</sup> week of the semester
- Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4<sup>th</sup> week of the semester
- Second assignment at the end of 9<sup>th</sup> week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)**

- At the end of the 13<sup>th</sup> week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

**CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

### Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 2 sub- questions), should have a mix of topics under that module.

The students have to answer 5 full questions, selecting one full question from each module.


The SEE question paper will be set for 100 marks and marks scored will be proportionately reduced to 50 marks

## 13.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	Teaching Method	% of Portion
1	1	Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics),	Chalk and Talk, Power-point Presentation	20
	2	Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19, Forensics – DNA fingerprinting)	Chalk and Talk, Power-point Presentation	



	3	Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins),	Chalk and Talk, Power-point Presentation,	
	4	Lipids (biodiesel, cleaning agents /detergents)	Chalk and Talk, Power-point Presentation	
	5	Enzymes (glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching).	Chalk and Talk, Power-point Presentation	
2	6	Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG).	Chalk and Talk, Power-point Presentation	20
	7	Brain as a CPU system (Robotic arms for prosthetics. Engineering solutions for Parkinson's disease).	Chalk and Talk, Power-point Presentation	
	8	Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye).	Chalk and Talk,	
	9	Heart as a pump system (architecture, electrical signalling - ECG monitoring and heart related issues)	Chalk and Talk, Power-point Presentation	
	10	Reasons for blockages of blood vessels, design of stents, pace makers, defibrillators).	Chalk and Talk, Power-point Presentation	
3	11	Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology).	Chalk and Talk, Power-point Presentation	20
	12	Lungs as purification system (COPD, Ventilators, Heart-lung machine).	Chalk and Talk, Power-point Presentation	
	13	Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems).	Chalk and Talk, Power-point Presentation	
	14	Muscular and Skeletal Systems as scaffolds (architecture, mechanisms).	Chalk and Talk, Power-point Presentation	
	15	Muscular and Skeletal Systems as scaffolds (bioengineering solutions for muscular dystrophy and osteoporosis).	Chalk and Talk, Power-point Presentation	
4	16	Echolocation (ultrasonography, sonars),	Chalk and Talk, Power-point Presentation	20
	17	Photosynthesis (photovoltaic cells, bionic leaf).	Chalk and Talk, Power-point Presentation	
	18	Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces),	Chalk and Talk, Power-point Presentation	
	19	Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train).	Chalk and Talk, Power-point Presentation	
	20	Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perflouorocarbons (PFCs).	Chalk and Talk, Power-point Presentation	
	21	Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D printed foods.	Chalk and Talk, Power-point Presentation	

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5	22	Electrical tongue and electrical nose in food science,	Chalk and Talk, Power-point Presentation	20
	23	DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis.	Chalk and Talk, Power-point Presentation	
	24	Self- healing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes)	Chalk and Talk, Power-point Presentation	
	25	Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).	Chalk and Talk, Power-point Presentation	

#### 14.0 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 Section of Oscillations and Waves	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	10	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 2: University Questions on Modern Physics & Quantum Mechanics	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	12	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list

#### 15.0 QUESTION BANK

##### MODULE-1

1. What are Carbohydrates
2. Explain cellulose-based water filters
3. Explain PHA and PLA as bioplastics
4. Explain Nucleic acids
5. Write a note on DNA Vaccine for Rabies
6. Explain RNA vaccines for Covid19
7. Explain Forensics – DNA fingerprinting
8. Explain Proteins as food – whey protein and meat analogs
9. Explain Plant based proteins
10. What are lipids?
11. Explain biodiesel, cleaning agents/detergents
12. Explain uses of Enzymes in glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching.

##### MODULE-2

1. Explain Brain as a CPU system
2. Explain brain architecture, CNS and Peripheral Nervous System
3. Explain the signal transmission in brain
4. Explain EEG, Robotic arms for prosthetics.
5. Write a note on engineering solutions for Parkinson's disease
6. Explain Eye as a Camera system



7. Explain Heart as a pump system
8. Explain ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators.

### MODULE-3





1. Explain Lungs as purification system
2. Explain architecture, gas exchange mechanisms, spirometry, abnormal lung physiology
3. Explain COPD
4. Explain Ventilators, Heart-lung machine.
5. Explain kidney as a filtration system
6. Explain in detail kidney architecture, mechanism of filtration, CKD, dialysis systems.
7. Explain Muscular and Skeletal Systems as scaffolds


### MODULE-4

1. Explain Echolocation
2. Explain Photosynthesis
3. How Bird flying is used in GPS and aircrafts
4. Explain Lotus leaf effect
5. Explain Plant burrs
6. Explain Shark skin
7. Explain Kingfisher beak.
8. Explain Human Blood substitutes
9. Explain hemoglobin-based oxygen carriers (HBOCs) and perflouorocarbons (PFCs).

### MODULE-5

1. Explain Bioprinting techniques and materials
2. Explain 3D printing of ear, bone and skin.
3. 3D printed foods.
4. Explain Electrical tongue and electrical nose in food science
5. Explain DNA origami and Biocomputing
6. Explain Bioimaging and Artificial Intelligence for disease diagnosis.
7. Explain Self- healing Bioconcrete
8. Bioremediation and Biomining via microbial surface adsorption

Prepared by	Checked by		
			
Prof. V.M.Bhumannavar	Prof.V.M.Bhumannavar	HOD	Principal

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<b>Subject Title</b>	<b>PYTHON PROGRAMMING LABORATORY</b>		
<b>Subject Code</b>	21CSL46	<b>IA Marks</b>	50
<b>No of Lecture Hrs + Practical Hrs / Week</b>	00L + 02P	<b>Exam Marks</b>	50
<b>Total No of Lecture + Practical Hrs</b>	24	<b>Exam Hours</b>	03
<b>CREDITS – 01</b>			

#### FACULTY DETAILS:

<b>Name:</b> Prof. Prasanna Patil	<b>Designation:</b> Asst. Professor	<b>Experience:</b> 9 Years
<b>No. of times course taught:</b> 01 Time		<b>Specialization:</b> Computer Science & Engineering

### 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	Programming in Java

### 2.0 Course Objectives

1. Demonstrate the use of IDLE or PyCharm IDE to create Python Applications.
2. Using Python programming language to develop programs for solving real-world problems.
3. Implement the Object-Oriented Programming concepts in Python.
4. Appraise the need for working with various documents like Excel, PDF, Word and Others.
5. Demonstrate regular expression using python programming.

### 3.0 Course Outcomes

The student, after successful completion of the course, will be able to

COs	Course Outcome	RBT Level	POs
<b>C216.1</b>	Demonstrate proficiency in handling of loops and creation of functions.	<b>L3</b>	<b>1,2,3,5,8,9,10,11,12</b>
<b>C216.2</b>	Identify the methods to create and manipulate lists, tuples and dictionaries.	<b>L3</b>	<b>1,2,3,5,8,9,10,11,12</b>
<b>C216.3</b>	Discover the commonly used operations involving regular expressions and file system.	<b>L3</b>	<b>1,2,3,5,8,9,10,11,12</b>
<b>C216.4</b>	Interpret the concepts of Object-Oriented Programming as used in Python.	<b>L3</b>	<b>1,2,3,5,8,9,10,11,12</b>
<b>C216.5</b>	Determine the need for scraping websites and working with PDF, JSON and other file formats.	<b>L3</b>	<b>1,2,3,5,8,9,10,11,12</b>
<b>Total Hours of instruction</b>			<b>24</b>


### 4.0 Course Content

<ul style="list-style-type: none"> <li>✓ Students should be familiarized about Python installation and setting Python environment.</li> <li>✓ Usage of IDLE or IDE like PyCharm should be introduced.</li> </ul> <p>Python Installation: <a href="https://www.youtube.com/watch?v=Kn1HF3oD19c">https://www.youtube.com/watch?v=Kn1HF3oD19c</a> PyCharm Installation: <a href="https://www.youtube.com/watch?v=SZUNUB6nz3g">https://www.youtube.com/watch?v=SZUNUB6nz3g</a></p>	
<b>PART A – List of problems for which student should develop program and execute in the Laboratory</b>	
1	Aim: Introduce the Python fundamentals, data types, operators, flow control and exception handling in Python






	<p>a) Write a python program to find the best of two test average marks out of three test's marks accepted from the user.</p> <p>b) Develop a Python program to check whether a given number is palindrome or not and also count the number of occurrences of each digit in the input number.</p> <p>Datatypes: <a href="https://www.youtube.com/watch?v=gCCVsvgR2KU">https://www.youtube.com/watch?v=gCCVsvgR2KU</a></p> <p>Operators: <a href="https://www.youtube.com/watch?v=v5MR5JnKcZI">https://www.youtube.com/watch?v=v5MR5JnKcZI</a></p> <p>Flow Control: <a href="https://www.youtube.com/watch?v=PqFKRqpHrjw">https://www.youtube.com/watch?v=PqFKRqpHrjw</a></p> <p>For loop: <a href="https://www.youtube.com/watch?v=0ZvaDa8eT5s">https://www.youtube.com/watch?v=0ZvaDa8eT5s</a></p> <p>While loop: <a href="https://www.youtube.com/watch?v=HZARImviDxg">https://www.youtube.com/watch?v=HZARImviDxg</a></p> <p>Exceptions: <a href="https://www.youtube.com/watch?v=6SPDvPK38tw">https://www.youtube.com/watch?v=6SPDvPK38tw</a></p>
2	<p>Aim: Demonstrating creation of functions, passing parameters and return values</p> <p>a) Defined as a function <math>F</math> as <math>F_n = F_{n-1} + F_{n-2}</math>. Write a Python program which accepts a value for <math>N</math> (where <math>N &gt; 0</math>) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed.</p> <p>b) Develop a python program to convert binary to decimal, octal to hexadecimal using functions.</p> <p>Functions: <a href="https://www.youtube.com/watch?v=BVfCWuca9nw">https://www.youtube.com/watch?v=BVfCWuca9nw</a></p> <p>Arguments: <a href="https://www.youtube.com/watch?v=ijXMGpoMkhQ">https://www.youtube.com/watch?v=ijXMGpoMkhQ</a></p> <p>Return value: <a href="https://www.youtube.com/watch?v=nuNXiEDnM44">https://www.youtube.com/watch?v=nuNXiEDnM44</a></p>
3	<p>Aim: Demonstration of manipulation of strings using string methods</p> <p>a) Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters.</p> <p>b) Write a Python program to find the string similarity between two given strings</p> <p>Sample Output:</p> <p>Original string:</p> <p>Python Exercises</p> <p>Python Exercises</p> <p>Similarity between two said strings: 1.0</p> <p>Sample Output:</p> <p>Original string:</p> <p>Python Exercises</p> <p>Python Exercise</p> <p>Similarity between two said strings: 0.967741935483871</p> <p>Strings: <a href="https://www.youtube.com/watch?v=ISItwlnF0eU">https://www.youtube.com/watch?v=ISItwlnF0eU</a></p> <p>String functions: <a href="https://www.youtube.com/watch?v=9a3CxJyTq00">https://www.youtube.com/watch?v=9a3CxJyTq00</a></p>
4	<p>Aim: Discuss different collections like list, tuple and dictionary</p> <p>a) Write a python program to implement insertion sort and merge sort using lists</p> <p>b) Write a program to convert roman numbers in to integer values using dictionaries.</p> <p>Lists: <a href="https://www.youtube.com/watch?v=Eaz5e6M8tL4">https://www.youtube.com/watch?v=Eaz5e6M8tL4</a></p> <p>List methods: <a href="https://www.youtube.com/watch?v=8-RDVWGktuI">https://www.youtube.com/watch?v=8-RDVWGktuI</a></p> <p>Tuples: <a href="https://www.youtube.com/watch?v=bdS4dHIJGBc">https://www.youtube.com/watch?v=bdS4dHIJGBc</a></p> <p>Tuple operations: <a href="https://www.youtube.com/watch?v=TIItKabcTTQ4">https://www.youtube.com/watch?v=TIItKabcTTQ4</a></p>

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	Dictionary: <a href="https://www.youtube.com/watch?v=4Q0pW8XB0kc">https://www.youtube.com/watch?v=4Q0pW8XB0kc</a> Dictionary methods: <a href="https://www.youtube.com/watch?v=oLeNHuORpNY">https://www.youtube.com/watch?v=oLeNHuORpNY</a>
5	Aim: Demonstration of pattern recognition with and without using regular expressions a) Write a function called isphonenummer () to recognize a pattern 415-555-4242 without using regular expression and also write the code to recognize the same pattern using regular expression. b) Develop a python program that could search the text in a file for phone numbers (+919900889977) and email addresses (sample@gmail.com) Regular expressions: <a href="https://www.youtube.com/watch?v=LnzFnZfHLS4">https://www.youtube.com/watch?v=LnzFnZfHLS4</a>
6	Aim: Demonstration of reading, writing and organizing files. a) Write a python program to accept a file name from the user and perform the following operations 1. Display the first N line of the file 2. Find the frequency of occurrence of the word accepted from the user in the file b) Write a python program to create a ZIP file of a particular folder which contains several files inside it. Files: <a href="https://www.youtube.com/watch?v=vuyb7CxZgbU">https://www.youtube.com/watch?v=vuyb7CxZgbU</a> <a href="https://www.youtube.com/watch?v=FqcjKewJTQ0">https://www.youtube.com/watch?v=FqcjKewJTQ0</a> File organization: <a href="https://www.youtube.com/watch?v=MRuq3SRXses">https://www.youtube.com/watch?v=MRuq3SRXses</a>
7	Aim: Demonstration of the concepts of classes, methods, objects and inheritance a) By using the concept of inheritance write a python program to find the area of triangle, circle and rectangle. b) Write a python program by creating a class called Employee to store the details of Name, Employee_ID, Department and Salary, and implement a method to update salary of employees belonging to a given department. OOP's concepts: <a href="https://www.youtube.com/watch?v=qiSCMNBP2g">https://www.youtube.com/watch?v=qiSCMNBP2g</a> Inheritance: <a href="https://www.youtube.com/watch?v=Cn7AkDb4pIU">https://www.youtube.com/watch?v=Cn7AkDb4pIU</a>
8	Aim: Demonstration of classes and methods with polymorphism and overriding a) Write a python program to find the whether the given input is palindrome or not (for both string and integer) using the concept of polymorphism and inheritance. Overriding: <a href="https://www.youtube.com/watch?v=CcTzTuIsoFk">https://www.youtube.com/watch?v=CcTzTuIsoFk</a>
9	Aim: Demonstration of working with excel spreadsheets and web scraping a) Write a python program to download the all XKCD comics b) Demonstrate python program to read the data from the spreadsheet and write the data in to the spreadsheet Web scraping: <a href="https://www.youtube.com/watch?v=ng2o98k983k">https://www.youtube.com/watch?v=ng2o98k983k</a> Excel: <a href="https://www.youtube.com/watch?v=nsKNPHJ9iPc">https://www.youtube.com/watch?v=nsKNPHJ9iPc</a>
10	Aim: Demonstration of working with PDF, word and JSON files a) Write a python program to combine select pages from many PDFs b) Write a python program to fetch current weather data from the JSON file PDFs: <a href="https://www.youtube.com/watch?v=q70xzDG6nls">https://www.youtube.com/watch?v=q70xzDG6nls</a> <a href="https://www.youtube.com/watch?v=JhQVD7Y1bsA">https://www.youtube.com/watch?v=JhQVD7Y1bsA</a> <a href="https://www.youtube.com/watch?v=FcrW-ESdY-A">https://www.youtube.com/watch?v=FcrW-ESdY-A</a> Word files: <a href="https://www.youtube.com/watch?v=ZU3cS151jWE">https://www.youtube.com/watch?v=ZU3cS151jWE</a> JSON files: <a href="https://www.youtube.com/watch?v=9N6a-VLba2I">https://www.youtube.com/watch?v=9N6a-VLba2I</a>

**PART B – Practical Based Learning**

A problem statement for each batch is to be generated in consultation with the co-examiner and student should develop an algorithm, program and execute the program for the given problem with appropriate outputs.

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		<b>Academics</b>
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## 5.0 Relevance to future subjects

SL. No	Semester	Subject	Topics / Relevance
01	VI	Project work	Academic Mini Project
02	VIII	Project work	Academic Project

## 6.0 Relevance to Real World

SL. No	Real World Mapping
01	Development of Python Applications.
02	Development of Database Applications using Python.
03	Development of Web Applications using Python.

## 7.0 Books Used and Recommended to Students

Text Books
<ol style="list-style-type: none"> <li>1. Al Sweigart, "Automate the Boring Stuff with Python", 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <a href="https://automatetheboringstuff.com/">https://automatetheboringstuff.com/</a>)</li> <li>2. Reema Thareja "Python Programming Using Problem Solving Approach" Oxford University Press.</li> <li>3. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at <a href="http://greenteapress.com/thinkpython2/thinkpython2.pdf">http://greenteapress.com/thinkpython2/thinkpython2.pdf</a>)</li> </ol>
Reference Books
<ol style="list-style-type: none"> <li>1. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor &amp; Francis, 2018. ISBN-13: 978-0815394372</li> <li>2. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058.</li> <li>3. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd, 2015. ISBN-13: 978-8126556014</li> <li>4. Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365</li> </ol>
Additional Study material & e-Books
<ol style="list-style-type: none"> <li>1. "Python Crash Course" by Eric Matthes: Website: <a href="https://ehmatthes.github.io/pcc/">https://ehmatthes.github.io/pcc/</a> Description: A beginner-friendly book that covers Python fundamentals and practical projects.</li> <li>2. "Automate the Boring Stuff with Python" by Al Sweigart: Website: <a href="https://automatetheboringstuff.com/">https://automatetheboringstuff.com/</a> Description: Teaches how to use Python for automating common tasks, such as working with files, web scraping, and more.</li> <li>3. "Python Cookbook" by David Beazley and Brian K. Jones: Website: <a href="https://www.oreilly.com/library/view/python-cookbook-3rd/9781449357337/">https://www.oreilly.com/library/view/python-cookbook-3rd/9781449357337/</a> Description: Offers a collection of Python recipes and solutions for various programming tasks.</li> <li>4. "Fluent Python" by Luciano Ramalho: Website: <a href="https://www.oreilly.com/library/view/fluent-python/9781491946237/">https://www.oreilly.com/library/view/fluent-python/9781491946237/</a> Description: Provides an in-depth understanding of Python's features and idioms for writing efficient and expressive code.</li> <li>5. "Python for Data Analysis" by Wes McKinney: Website: <a href="https://www.oreilly.com/library/view/python-for-data/9781491957653/">https://www.oreilly.com/library/view/python-for-data/9781491957653/</a> Description: Focuses on using Python for data manipulation, analysis, and visualization using popular libraries like pandas.</li> <li>6. "Dive into Python 3" by Mark Pilgrim: Website: <a href="https://diveinto.org/python3/">https://diveinto.org/python3/</a> Description: A comprehensive guide to Python 3, covering topics from basic syntax to advanced concepts.</li> <li>7. "Python Data Science Handbook" by Jake VanderPlas:</li> </ol>



Website: <https://jakevdp.github.io/PythonDataScienceHandbook/>

Description: Covers essential tools and techniques for data science in Python, including NumPy, Pandas, Matplotlib, and more.

8. "Effective Python" by Brett Slatkin: Website: <https://effectivepython.com/>

Description: Offers best practices and tips for writing Python code that is efficient, readable, and maintainable.

9. "Think Python" by Allen B. Downey: Website: <https://greenteapress.com/wp/think-python-2e/>

Description: A beginner-friendly introduction to Python programming, with an emphasis on problem-solving and algorithmic thinking.

10. "Python Testing with pytest" by Brian Okken: Website: <https://pragprog.com/titles/bopytest/python-testing-with-pytest/>

Description: Focuses on using pytest framework for testing Python code effectively.

## 8.0

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

#### Website and Internet Contents References

1. <a href="https://www.python.org/">https://www.python.org/</a>
2. <a href="https://docs.python.org/">https://docs.python.org/</a>
3. <a href="https://realpython.com/">https://realpython.com/</a>
4. <a href="https://www.geeksforgeeks.org/python-programming-language/">https://www.geeksforgeeks.org/python-programming-language/</a>
5. <a href="https://www.w3schools.com/python/">https://www.w3schools.com/python/</a>
6. <a href="https://www.tutorialspoint.com/python/index.htm">https://www.tutorialspoint.com/python/index.htm</a>
7. <a href="https://stackoverflow.com/questions/tagged/python">https://stackoverflow.com/questions/tagged/python</a>
8. <a href="https://github.com/">https://github.com/</a>
9. <a href="https://www.kaggle.com/">https://www.kaggle.com/</a>
10. <a href="https://www.pythonweekly.com/">https://www.pythonweekly.com/</a>

## 9.0

### Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Python Software Foundation (PSF) Newsletter	<a href="https://www.python.org/psf/newsletter/">https://www.python.org/psf/newsletter/</a>
2	Python Weekly	<a href="https://www.pythonweekly.com/">https://www.pythonweekly.com/</a>
3	Real Python	<a href="https://realpython.com/">https://realpython.com/</a>
4	Python Journal	<a href="https://www.pythonjournal.org/">https://www.pythonjournal.org/</a>
5	The Python Papers	<a href="http://ojs.pythonpapers.org/">http://ojs.pythonpapers.org/</a>

## 10.0

### Examination Note

#### Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

#### Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.



- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8<sup>th</sup> week of the semester and the second test shall be conducted after the 14<sup>th</sup> week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).  
The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

### Semester End Evaluation (SEE):

1. SEE marks for the practical course is 50 Marks.
2. SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
3. All laboratory experiments are to be included for practical examination.
4. (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
5. Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
6. Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
7. General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
8. Students can pick one experiment from the questions lot of PART A with equal choice to all the students in a batch. For PART B examiners should frame a question for each batch, student should develop an algorithm, program, execute and demonstrate the results with appropriate output for the given problem.
9. Weightage of marks for PART A is 80% and for PART B is 20%. General rubrics suggested to be followed for part A and part B.
10. Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero (Not allowed for Part B).
11. The duration of SEE is 03 hours
12. Rubrics suggested in Annexure-II of Regulation book

## Internal Assessment:

### Scheme of Evaluation for Continuous Assessment (30 Marks)

Each Experiment will be evaluated for 10 marks & then total sum will be reduce it to 30 Marks.

Description	Max. marks
Observation, Write-up of Procedure/ Program/ Algorithm and Execution of Experiment	04
Viva-Voce	02
Record Writing	04
Total	10

### Scheme of Evaluation for Internal Assessment (20 Marks)

- Each Lab IA will be conducted for 50 marks & then will be reduced to 20 Marks.

Description	Max. marks
Write-up of Procedure/ Program/ Algorithm	10
Conduction / Execution	25






Viva-Voce	15
Total	50

## 11.0 Course Delivery Plan

Expt. No	Lecture / Practical No	Name of the Experiment	% Of Portion
		PART-A	
1		Aim: Introduce the Python fundamentals, data types, operators, flow control and exception handling in Python a) Write a python program to find the best of two test average marks out of three test's marks accepted from the user. b) Develop a Python program to check whether a given number is palindrome or not and also count the number of occurrences of each digit in the input number.	9.09%
2		Aim: Demonstrating creation of functions, passing parameters and return values a) Defined as a function F as $F_n = F_{n-1} + F_{n-2}$ . Write a Python program which accepts a value for N (where $N > 0$ ) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed. b) Develop a python program to convert binary to decimal, octal to hexadecimal using functions.	9.09%
3		Aim: Demonstration of manipulation of strings using string methods c) Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters. d) Write a Python program to find the string similarity between two given strings Sample Output: Original string: Python Exercises Python Exercises Similarity between two said strings: 1.0 Sample Output: Original string: Python Exercises Python Exercise Similarity between two said strings: 0.967741935483871	9.09%
4		Aim: Discuss different collections like list, tuple and dictionary a) Write a python program to implement insertion sort and merge sort using lists b) Write a program to convert roman numbers in to integer values using dictionaries.	9.09%
5		Aim: Demonstration of pattern recognition with and without using regular expressions a) Write a function called isphonenumner () to recognize a pattern 415-555-4242 without using regular expression and also write the code to recognize the same pattern using regular expression. b) Develop a python program that could search the text in a file for phone numbers (+919900889977) and email addresses (sample@gmail.com)	9.09%

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6	Aim: Demonstration of reading, writing and organizing files. a) Write a python program to accept a file name from the user and perform the following operations 1. Display the first N line of the file 2. Find the frequency of occurrence of the word accepted from the user in the file b) Write a python program to create a ZIP file of a particular folder which contains several files inside it.	9.09%
7	Aim: Demonstration of the concepts of classes, methods, objects and inheritance a) By using the concept of inheritance write a python program to find the area of triangle, circle and rectangle. b) Write a python program by creating a class called Employee to store the details of Name, Employee_ID, Department and Salary, and implement a method to update salary of employees belonging to a given department.	9.09%
8	Aim: Demonstration of classes and methods with polymorphism and overriding a) Write a python program to find the whether the given input is palindrome or not (for both string and integer) using the concept of polymorphism and inheritance.	9.09%
9	Aim: Demonstration of working with excel spreadsheets and web scraping a) Write a python program to download the all XKCD comics b) Demonstrate python program to read the data from the spreadsheet and write the data in to the spreadsheet	9.09%
10	Aim: Demonstration of working with PDF, word and JSON files a) Write a python program to combine select pages from many PDFs b) Write a python program to fetch current weather data from the JSON file	9.09%
<b>PART-B</b>		
	A problem statement for each batch is to be generated in consultation with the co-examiner and student should develop an algorithm, program and execute the program for the given problem with appropriate outputs.	9.09%

## 12.0 Question Bank

SL. NO.	Viva Questions
1	What is Python?
2	What is the difference between a Python list and a tuple?
3	How do you comment in Python?
4	What is the purpose of the 'if' statement in Python?
5	How do you define a function in Python?
6	What is the 'range()' function used for?
7	How do you take user input in Python?
8	What is a module in Python?
9	How do you import a module in Python?
10	What is the purpose of the 'random' module in Python?
11	How do you open and close a file in Python?
12	How do you write text to a file in Python?
13	What is the purpose of the 'try-except' block?
14	What is a dictionary in Python?
15	How do you add elements to a list in Python?
16	What is the difference between '==' and 'is' in Python?




17	What is the purpose of the 'len()' function in Python?
18	How do you convert a string to an integer in Python?
19	What is the 'pass' statement used for in Python?
20	How do you iterate over a dictionary in Python?
21	What is the purpose of the 'strip()' method in Python?
22	How do you check if a value exists in a list in Python?
23	What is the purpose of the 'break' statement in Python?
24	How do you concatenate two strings in Python?
25	What is the purpose of the 'format()' method in Python?
26	How do you convert a list to a tuple in Python?
27	What is the purpose of the 'sorted()' function in Python?
28	How do you define a global variable in Python?
29	What is the purpose of the 'enumerate()' function in Python?
30	How do you find the maximum value in a list in Python?
31	What are decorators in Python?
32	Explain the difference between a shallow copy and a deep copy in Python.
33	How do you handle file exceptions in Python?
34	What is the difference between a class method and an instance method in Python?
35	How do you handle multiple exceptions in Python?
36	What is method overloading in Python?
37	What is a metaclass in Python?
38	How do you handle multithreading in Python?
39	What is the purpose of the 'json' module in Python?
40	How do you implement inheritance in Python?
41	Explain the concept of name spaces in Python.
42	What is the purpose of the 're' module in Python?
43	How do you implement polymorphism in Python?
44	What is the difference between a list and a tuple?
45	What is a Python dictionary?
46	How do you access values in a dictionary in Python?
47	How do you add a key-value pair to a dictionary in Python?
48	How do you remove a key-value pair from a dictionary in Python?
49	What is a Python set?
50	How do you add an element to a set in Python?
51	How do you remove an element from a set in Python?
52	What is the difference between a set and a list?
53	What are Python functions?
54	What are function parameters in Python?
55	What are function arguments in Python?

### 13.0 University Result

Examination	# of Students Appeared	# of Students Passed	FCD	FC	SC	Fail	% Passing
-	-	-	-	-	-	-	-

Prepared by	Checked by		
Prof. Prasanna Patil	Dr. Mahesh Huddar	HOD	Principal

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		<b>Academics</b>
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<b>FACULTY DETAILS:</b>		
<b>Name:</b> Prof.M. S. Futane	<b>Designation:</b> Asst. Prof.	<b>Experience:</b> 17Years
<b>No. of times course taught:</b> 5	<b>Specialization:</b> CIM	

## 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
-	-	-	-

## 2.0 Course Objectives

This course will enable the students

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

## 3.0 Course Outcomes

After study of the course, the students are able to

	Course Outcome	Cognitive Level	POs
C01	Analyse the basic structure of Indian Constitution	U	1, 5
C02	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.	U	1, 5
C03	know about our Union Government, political structure & codes, procedures.	U	1, 5
C04	Understand our State Executive & Elections system of India.	U	1, 5
C05	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.	U	1, 5
<b>Total Hours of instruction</b>		<b>50</b>	

## 4.0 Course Content

### Module-1


Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.

### Module-2

FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.

### Module-3

Union Executive : Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet,

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Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.

#### Module-4

State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.

#### Module-5

Professional Ethics: Ethics & Values. Types of Ethics. Scope & Aims of Professional & Engineering Ethics. Positive and Negative Faces of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.

### 5.0 Books Used and Recommended to Students

<b>Text Books</b>
1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.
2. "Engineering Ethics", M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall, 2004.
<b>Reference Books</b>
1. "Samvidhana Odu" - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.
2. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
3. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008.
4. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.

### 6.0 Examination Note

Internal Assessment: 50 Marks

### 7.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	1	The Necessity of the Constitution, The Societies before and after the Constitution adoption.	20
	2	Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly	
	3	Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations.	
	4	Directive Principles of State Policy (DPSP) and its present relevance in our society with examples.	
	5	Fundamental Duties and its Scope and significance in Nation building.	
2	6	Parliamentary System, Federal System, Centre-State Relations.	
	7	Union Executive – President, Prime Minister, Union Cabinet, Parliament	
	8	LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism	







9. The Mountbatten plan was executed in the year  
a. 1946 b. 1949 c. 1950 d. 1947.
10. The Constitution is divided into \_\_\_ Parts \
- a. 21 b. 22 c. 23 d. 24.

### Module – II:

1. The Words "We the People of India" in the preamble of the Indian Constitution refer to all  
a. The members of the Drafting committee c. People of India  
b. The Members of the Drafting committee & Constituent Assembly d. None of these.
2. The Preamble of Indian Constitution indicates  
a. The Date of Commencement of the Indian Constitution  
b. The Rights given to socially and economically backward class  
c. The role to be played by the Judiciary in securing Social, Political and economic justice to the Citizen of India.  
d. None of these.
3. The Secular Nature of the Preamble recognizes  
a. All religion b. Only one religion c. attitude of neutrality towards all religions d. None of these.
4. The nature of our Constitution is  
a. Federal b. Unitary c. Federal with unitary features d. Unitary with federal features.
5. The Preamble tells us the  
a. Source of the Constitution c. The importance of the Constitution  
b. Number of religions d. None of these.

### Module – III:

1. The Fundamental rights are contained in \_\_\_\_\_ part of the Constitution  
a. I b. II c. III d. IV
2. The Fundamental rights are classified into \_\_\_\_\_  
a. 5 groups b. 6 groups c. 7 groups d. 8 groups
3. The provisions of Article 14 does not apply to  
a. President & Governor c. Chief-minister & Governor  
b. Prime-minister & Chief-ministers d. President & Prime-minister.
4. Article 15 applies to  
a. Citizens only b. Aliens only c. both a & b d. None of these.
5. Article 19 gives us \_\_\_ freedoms  
a. 4 b. 5 c. 6 d. 7
6. Article 32 refers to  
a. Right against exploitation c. Cultural & Educational rights  
b. Right to Equality d. Right to Constitutional remedies
7. Which of the following has been dropped from the List of fundamental rights?  
a. Right to liberty b. Right to Property c. Right to Religion d. Right against Exploitation.
8. Which Article of the constitution guarantees the Right to life and personal liberty?  
a. 20 b. 21 c. 22 d. 23
9. Which Article of the Constitution has been described as the very soul of the Constitution and the very heart of it?  
a. 32 b. 19 c. 21 d. 21A
10. Cultural and Educational rights are contained in Articles?  
a. 25-26 b. 27-28 c. 29-30 d. 73-74





### Module – IV:




- The Directive Principles of state policy aim at
  - Establishing a free society
  - Establishing a genuine political democracy.
  - Establishing social, economic base for democracy
  - All of the above.
- The Constitution makers have taken the idea of Directive Principles from the Constitution of
  - Ireland
  - America
  - Britain
  - Canada.
- The Enforcement of the Directive Principles depends upon
  - People
  - Judiciary
  - Opposition Party
  - Ruling Party.
- Who has aptly described the Directive Principles of State policy as a "Novel Feature" of the Constitution of India
  - L.M.Singhvi
  - Motilal Nehru
  - N.Madhava Rao
  - Dr.B.R.Ambedkar
- Which directive Principle has not been enforced till now?
  - Belief in Peace
  - Free Education upto certain classes
  - Protection of Animals
  - Enforcement of prohibition.
- Which is not a Directive Principle of State Policy?
  - Participation of workers in the management of industries
  - Organization of agriculture and Animal Husbandry
  - Uniform Civil Code for all the citizens
  - Abolition of titles.

**Module – V:**

- Which of the following is not a type of cyber crime?
  - Data theft
  - Forgery
  - Damage to data and systems
  - Installing antivirus for protection
- Cyber-laws are incorporated for punishing all criminals only.
  - True
  - False
- Cyber-crime can be categorized into \_\_\_\_\_ types.
  - 4
  - 3
  - 2
  - 6
- Which of the following is not a type of peer-to-peer cyber-crime?
  - Phishing
  - Injecting Trojans to a target victim
  - MiTM
  - Credit card details leak in deep web
- Which of the following is not an example of a computer as weapon cyber-crime?
  - Credit card fraudulent
  - Spying someone using keylogger
  - IPR Violation
  - Pornography

Prepared by	Checked by		
			
Prof. M. S Futane	Prof. M. S Futane	HOD	Principal

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<b>Subject Title</b>	<b>WEB PROGRAMMING</b>		
<b>Subject Code</b>	21CSL481	<b>IA Marks</b>	50
<b>Number of Lecture Hrs / Week</b>	01 + 00 + 00	<b>Exam Marks</b>	50
<b>Total Number of Lecture Hrs</b>	12T+12P	<b>Exam Hours</b>	02
<b>CREDITS – 01</b>			

<b>FACULTY DETAILS:</b>		
<b>Name:</b> Prof. S. I. Mane	<b>Designation:</b> Assistant Professor	<b>Experience:</b> 08 Years
<b>No. of times course taught:</b> 01	<b>Specialization:</b> Computer Networks Engineering	

## 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 and Applications
03	Computer Science and Engineering	III	Object Oriented Programming With Java Laboratory

## 2.0 Course Objectives

This course will enable students to

1. Learn Web tool box and history of web browsers.
2. Learn HTML, XHTML tags with utilizations.
3. Know CSS with dynamic document utilizations.
4. Learn JavaScript with Element access in JavaScript.
5. Logically plan and develop web pages.

## 3.0 Course Outcomes

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


	Course Outcome	Cognitive Level	POs
C218.1	Describe the fundamentals of web and concept of HTML.	L2	PO-1, 2, 3, 4, 5, 9, 10 PSO-1,2
C218.2	Use the concepts of HTML, XHTML to construct the web pages.	L2	PO-1, 2, 3, 4, 5,9, 10 PSO-1,2
C218.3	Interpret CSS for dynamic documents	L2	PO-1, 2, 3, 4, 5,9, 10 PSO-1,2
C218.4	Evaluate different concepts of JavaScript & Construct dynamic documents.	L2	PO-1, 2, 3, 4,5, 9, 10 PSO-1,2
C218.5	Design a small project with JavaScript and XHTML.	L2	PO-1, 2, 3, 4, 5,9, 10 PSO-1,2
<b>Total Hours of instruction</b>			<b>40</b>

## 4.0 Course Content

### Module 1:

**Introduction to WEB Programming:** Internet, WWW, Web Browsers, and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox.

**Textbook 1: Chapter 1(1.1 to 1.9)**

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### Module 2:

**HTML and XHTML:** Origins of HTML and XHTML, Basic syntax, Standard XHTML document structure, Basic text markup, Images, Hypertext Links, Lists, Tables. Forms, Frames in HTML and XHTML, Syntactic differences between HTML and XHTML.

**Textbook 1: Chapter 2(2.1 to 2.10)**

### Module-3:

**CSS:** Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, Background images, tags.

**Textbook 1: Chapter 3(3.1 to 3.12)**

### Module-4:

**Java Script – I:** Object orientation and JavaScript; General syntactic characteristics; Primitives, Operations, and expressions; Screen output and keyboard input.

**Textbook 1: Chapter 4(4.1 to 4.5)**

### Module-5:

**Java Script – II:** Control statements, Object creation and Modification; Arrays; Functions; Constructor; Pattern matching using expressions; Errors, Element access in JavaScript.

**Textbook 1: Chapter 4(4.6 to 4.14)**

### Lab Experiments:

- Design and develop a web page to create student profile using basic html tags.
- Design and develop a web page to create travel book for demonstrating Hyperlinks.
- Design and develop a web page to display list of courses offered by college using Lists.
- Design and develop a web page to create class time-table using tables.
- Design and develop a web page to display table of content chapterwise using frames.
- Design and develop a web page to create college website using cascading stylesheets.
- Design and develop a javascript program to design simple calculator to perform the following operations sum, difference, product and quotient .
- Design and develop a javascript program that calculates the squares and cubes of the number from 0 to 10 and outputs html texts that displays the resulting values in an html table format.
- Design and develop a javascript program to display weekday name using switch case.
  - Design and develop a javascript program to display the numbers 1 to 4 using regular expression.
- Design and develop a javascript program to validate a form which consist a Name,age,email,gender.

## 5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	V	Database Management System Laboratory With Mini Project	front-end tools
02	VI	Fullstack Development	HTML, CSS, JavaScript
03	VIII	Project work	

## 6.0 Relevance to Real World

SL.No	Real World Mapping
01	Final year projects

## 7.0 Gap Analysis and Mitigation





Sl. No.	Delivery Type	Details
01	YouTube Videos	1. Fundamentals of WEB Programming: <a href="https://www.youtube.com/watch?v=DR9dr6gxhDM">https://www.youtube.com/watch?v=DR9dr6gxhDM</a> 2. HTML and XHTML: <a href="https://www.youtube.com/watch?v=A1XIIDDXgwg">https://www.youtube.com/watch?v=A1XIIDDXgwg</a> 3. CSS: <a href="https://www.youtube.com/watch?v=J35jug1uHzE">https://www.youtube.com/watch?v=J35jug1uHzE</a> 4. Java Script and HTML Documents: <a href="https://www.youtube.com/watch?v=Gd0RBdFRvFO">https://www.youtube.com/watch?v=Gd0RBdFRvFO</a> 5. Dynamic Documents with JavaScript: <a href="https://www.youtube.com/watch?v=HTFSIJALNKc">https://www.youtube.com/watch?v=HTFSIJALNKc</a>

## 8.0 Books Used and Recommended to Students

### Additional Reference

#### Textbooks

1. Robert W Sebesta, "Programming the World Wide Web", 6th Edition, Pearson Education, 2008.

#### Reference Books

1. M.Deitel, P.J.Deitel, A.B.Goldberg, "Internet & World Wide Web How to program", 3rd Edition, Pearson Education / PHI, 2004.
2. Chris Bates, "Web Programming Building Internet Applications", 3rd Edition, Wiley India, 2006.
3. Xue Bai et al, "The Web Warrior Guide to Web Programming", Thomson, 2003.
4. Sklar, "The Web Warrior Guide to Web Design Technologies", 1st Edition, Cengage Learning India

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

### Website and Internet Contents References

1. <http://www.tutorialspoint.com>
2. <http://www.w3schools.com>

## 10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	Smashing Magazine	<a href="https://www.smashingmagazine.com/">https://www.smashingmagazine.com/</a>

## 11.0 Examination Note

### Assessment Details (both CIE and SEE)


The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

### Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.

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- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

#### Semester End Evaluation (SEE):

- SEE marks for the practical course is 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- The duration of SEE is 02 hours

## 12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	1	<b>Introduction to WEB Programming:</b> Internet, WWW, Web Browsers, and Web Servers, URLs	20 %
	2	,MIME, HTTP, Security, The Web Programmers Toolbox	
2	3	<b>HTML and XHTML:</b> Origins of HTML and XHTML, Basic syntax, Standard XHTML document structure, Basic text markup, Images	20 %
	4	Hypertext Links, Lists, Tables.	
	5	Forms, Frames in HTML and XHTML, Syntactic differences between HTML and XHTML.	
3	6	<b>CSS:</b> Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms	20 %
	7	Font properties, List properties, Color, Alignment of text, Background images, tags.	
4	8	<b>Java Script – I:</b> Object orientation and JavaScript; General syntactic characteristics;	20 %
	9	Primitives, Operations, and expressions	
	10	Screen output and keyboard input.	
5	11	<b>Java Script – II:</b> Control statements, Object creation and Modification; Arrays; Functions; Constructor;	20 %
	12	Pattern matching using expressions; Errors, Element access in JavaScript.	

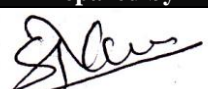
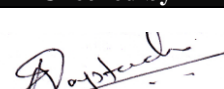


Expt. No.	Lab. No.	Content of Experiment	% of Portion
1	1	Design and develop a web page to create student profile using basic html tags.	10
2	2	Design and develop a web page to create travel book for demonstrating Hyperlinks.	10
3	3	Design and develop a web page to display list of courses offered by college using Lists.	10
4	4	Design and develop a web page to create class time-table using tables.	10
5	5	Design and develop a web page to display table of content chapterwise using frames.	10
6	6	Design and develop a web page to create college website using cascading stylesheets.	10
7	7	Design and develop a javascript program to design simple calculator to perform the following operations sum, difference, product and quotient .	10
8	8	Design and develop a javascript program that calculates the squares and cubes of the number from 0 to 10 and outputs html texts that displays the resulting values in an html table format.	10
9	9	a. Design and develop a javascript program to display weekday name using switch case. b. Design and develop a javascript program to display the numbers 1 to 4 using regular expression.	10
10	10	Design and develop a javascript program to validate a form which consist a Name, age, email,gender.	10


### 13.0 QUESTION BANK

1. What is mean by web browser, www, internet, URL, web page?
2. What is the difference between unordered lists and ordered lists?
3. Why is semantic structure so important for HTML?
4. What role does W3C play in the implementation of XHTML?
5. What are the three main aims of HTML5?
6. What are nested HTML elements?
7. What is semantic markup? Why is it important?
8. Describe the difference between a relative and an absolute reference. When should each be used?
9. What are the advantages of using the new HTML5 semantic elements? Disadvantages?
10. What is a CSS selector?
11. Compare the approach the W3C has used with CSS3 in comparison to CSS2.1.
12. What are inline styles?
13. What is the difference between a relative and an absolute measure unit in CSS? Why are relative units preferred over absolute units in CSS?
14. What is an element selector and a grouped element selector? Provide an example of each.  
What are the elements used to define the structure of an HTML table?
15. Describe the purpose of a table caption and the table heading elements.
16. What are <tr> and <td> tags?
17. Create a table that correctly uses the caption, thead, tfoot, and tbody elements. Briefly discuss the role of each of these elements. What is a form?
18. What is a text input control?
19. What are the two different ways of passing information via the URL?
20. What is the purpose of the action attribute?

### 14.0 University Result

Examination	FCD	FC	SC	FAIL	% Passing

Prepared by	Checked by		
 <b>Prof. S. I. Mane</b>	 <b>Prof. A. A. Daptardar</b>	 <b>HOD</b>	 <b>Principal</b>

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<b>Subject Title</b>	Universal Human Values-II: Understanding Harmony And Ethical		
<b>Subject Code</b>	21UHV49	<b>CIE Marks</b>	50
<b>Teaching Hrs / Week</b>	02	<b>SEE Marks</b>	50
<b>Total Hrs of Pedogogy</b>	20	<b>Exam Hours</b>	01
<b>CREDITS – 01</b>			

<b>FACULTY DETAILS:</b>		
<b>Name:</b> Prof. S.G.Huddar	<b>Designation:</b> Asst. Professor	<b>Experience:</b> 09 Years
<b>No. of times course taught:</b> 01 Times		<b>Specialization:</b> Power System

### 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	None	--	--

### 2.0 Course Objectives

This introductory course input is intended:


1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

This course is intended to provide a much-needed orientational input in value education to the young enquiring minds.

### 3.0 Course Outcomes

By the end of the course, students are expected to positively impact common graduate attributes like:

CO	Course Outcome	Cognitive Level	POs
C221.1	Holistic vision of life	L <sub>2</sub>	PO6, PO7 PO8, PO10,PO12
C221.2	Socially responsible behaviour	L <sub>2</sub>	PO6, PO7 PO8, PO10,PO12
C221.3	Environmentally responsible work	L <sub>2</sub>	PO6, PO7 PO8, PO10,PO12
C221.4	Ethical human conduct	L <sub>2</sub>	PO6, PO7 PO8, PO10,PO12
C221.5	Having Competence and Capabilities for Maintaining Health and Hygiene	L <sub>2</sub>	PO6, PO7 PO8, PO10,PO12
C221.6	Appreciation and aspiration for excellence (merit) and gratitude for all	L <sub>2</sub>	PO6, PO7 PO8, PO10,PO12
<b>Total Hours of instruction</b>			<b>20</b>

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## 4.0 Course Content

### Module-1

**Introduction to Value Education (4 hours)** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations

### Module-2

**Harmony in the Human Being (4 hours)** Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health

### Module-3

**Harmony in the Family and Society (4 hours)** Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order

### Module-4

**Harmony in the Nature/Existence (4 hours)** Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence

### Module-5

**Implications of the Holistic Understanding – a Look at Professional Ethics (4 hours)** Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

## 5.0 Relevance to future subjects:


SL. No	Semester	Subject	Topics / Relevance
01	-----	None	-----

## 6.0 Relevance to Real World

SL. No	Real World Mapping
01	Self enhancement, Openness to change, Self transcendence & Conservation.

## 7.0 Books Used and Recommended to Students



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### Text Books

- The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1
- The Teacher's Manual "Manual for A Foundation Course in Human Values and Professional Ethics", R R Gaur, R Asthana, G

### Reference Books

- Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
- The Story of Stuff (Book).
- The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
- Small is Beautiful - E. F Schumacher.
- Slow is Beautiful - Cecile Andrews
- Economy of Permanence - J C Kumarappa
- Bharat Mein Angreji Raj – Pandit Sunderlal
- Rediscovering India - by Dharampal
- Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
- India Wins Freedom - Maulana Abdul Kalam Azad
- Vivekananda - Romain Rolland (English)
- Gandhi - Romain Rolland (English)
- Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
- Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
- A Nagaraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
- P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
- A N Tripathy, 2003, Human Values, New Age International Publishers
- Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
- E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
- M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
- B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
- B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.


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

#### Web links and Video Lectures (e-Resources):

- Value Education websites, <https://www.uhv.org.in/uhv-ii>, <http://uhv.ac.in>, <http://www.uptu.ac.in>
- Story of Stuff, <http://www.storyofstuff.com>
- [https://www.youtube.com/channel/UCQxWr5QB\\_eZUnwxSwxXEkQw](https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw)
- [https://fdp-si.aicte-india.org/8dayUHV\\_download.php](https://fdp-si.aicte-india.org/8dayUHV_download.php)
- <https://www.youtube.com/watch?v=8ovkLRYXIjE>
- <https://www.youtube.com/watch?v=OgdNx0X923I>
- <https://www.youtube.com/watch?v=nGRcbRpvGoU>
- <https://www.youtube.com/watch?v=sDxGXOgYEKM>

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

Sl. No	Magazines/Journals
1	AI Gore, An Inconvenient Truth, Paramount Classics, USA
2	<b>Charlie Chaplin, Modern Times, United Artists, USA</b>
3	IIT Delhi, Modern Technology – the Untold Story
4	Gandhi A., Right Here Right Now, Cyclewala Productions.

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		<b>Academics</b>
		<b>Course Plan</b>
		<b>2022-23 EVEN</b>

## 10.0 Examination Note

### Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

### Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks** (duration 01 hour)

Two assignments each of **10 Marks**

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (duration 01 hours)

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of **100 marks** and will be scaled down to **50 marks**

**Semester End Examination:** Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 01 hours)

1. The question paper will have 50 questions. Each question is set for 01 marks.
2. The students have to answer all the questions, selecting one full question from each module.

## 11.0 Course Delivery Plan

Module	Lecture No.	Content of Lecture	% of Portion
I	1	Right Understanding, Relationship and Physical Facility.	20%
	2	Understanding Value Education, Self-exploration as the Process for Value Education.	
	3	Continuous Happiness and Prosperity – the Basic Human Aspirations.	
	4	Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.	
II	5	Harmony in the Human Being Understanding Human being as the Co-existence of the Self and the Body.	20%
	6	Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self.	
	7	Understanding Harmony in the Self, Harmony of the Self with the Body.	
	8	Programme to ensure self-regulation and Health.	
III	9	Harmony in the Family and Society, the Basic Unit of Human Interaction.	20%
	10	'Trust' – the Foundational Value in Relationship.	
	11	'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human	



		Relationship.	
	12	Understanding Harmony in the Society, Vision for the Universal Human Order.	
IV	13	Harmony in the Nature/Existence Understanding Harmony in the Nature.	20%
	14	Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature.	
	15	Realizing Existence as Co-existence at All Levels.	
	16	The Holistic Perception of Harmony in Existence.	
V	17	Implications of the Holistic Understanding – a Look at Professional Ethics Natural Acceptance of Human Values.	20%
	18	Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order.	
	19	Competence in Professional Ethics Holistic Technologies.	
	20	Strategies for Transition towards Value-based Life and Profession.	

## 12.0

## QUESTION BANK

1. What is the state of liking and a holistic and all encompassing state of the mind that creates inner harmony?
  - a. Prosperity
  - b. **Happiness**
  - c. Innateness
  - d. Self-organized
2. What is called living with assumption for oneself as body and Living of human being only on the basis of physical facilities, and not with right understanding and relationship?
  - a. Human Consciousness
  - b. Happiness
  - c. Right Understanding
  - d. **Animal Consciousne**
3. Five basic guidelines for value education are Universal, Natural and verifiable, all encompassing, leading to harmony and
  1. Self exploration
  2. Education
  3. Right utilization
  4. **Rational**
4. What are the basic desires of every human being for which they are working.
  1. Physical facilities
  2. Realization and understanding
  3. Happiness and prosperity
  4. **Continuous happiness and prosperity**
5. When we participate in the larger order, this participation at different levels is known as our value. Values are outcome of
  1. Prosperity
  2. Happiness
  3. **Realization and understanding**
  4. Self exploration
6. Identify the solution which helps human being to transform from animal consciousness to human consciousness.
  1. **Right understanding**



2. Realization
3. Value education
4. Physical facilities.

7. To maintain harmony we have to work at four levels of living .Identify second level of living.

1. Self
2. **Family**
3. Nature
4. Society

8. Self exploration is a process which helps us to find out “What I am and What I really want to be “.Two mechanisms involved in self -exploration are

1. Realization and understanding
2. Natural and verifiable
3. **Natural acceptance and experimental validation**
4. Correctable and identifiable

9. Self exploration uses two mechanisms

1. **Natural acceptance and experiential validation**
2. Right Understanding and self exploration
3. Self investigation and self exploration
4. Natural acceptance and self investigation

10. Samridhi means

1. Happiness
2. Wealth
3. **Prosperity**
4. Health

11. What is the third level of living?

1. **Society**
2. Individual
3. Family
4. Nature

12. Developed nations are the live example of

1. **Prosperity**
2. Wealth
3. Happiness
4. Health


13. The participation of human beings is seen in two forms

1. Prosperity and Work
2. Values and Understanding
3. Behavior and Wealth
4. **Behavior and Work**

14. What are the outcomes of realization and understanding?

1. Work
2. **Values**
3. Happiness
4. Health

15. We become ..... by exploring our svatva and living accordingly

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	<i>Inculcating Values, Promoting Prosperity</i>	<b>Course Plan</b>
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi Recognized under 2(f) & 12B of UGC Act, 1956	<b>2022-23 EVEN</b>
<b>Accredited at 'A' Grade by NAAC &amp; Programmes Accredited by NBA:CSE &amp;ECE</b>		

- a. **Svatantra**
- b. Partantra
- c. Wealthy.
- d. Happy

16. Developed nations are the live example of health, wealth and wisdom. These three term scan be combined to form a single term as

- a. Developed
- b. **Prosperous**
- c. Harmony
- d. Happy

17. Contents of self-exploration area

- a. Desire and needs
- b. Program and needs
- c. Program and practical
- d. **Desire and Program**

18. Value education is becoming important for students now a days because value education helps students to correctly identify our


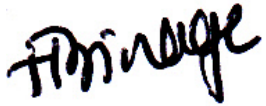


- a. Values
- b. Key to success
- c. **Aspirations**
- d. Needs

19. Three results are obtained from realization and understanding. Two of them are assurance and satisfaction find third one

- a. **Universality**
- b. Acceptance
- c. All-encompassing
- d. Self-verification

20. The person who are lack of physical facility stands for

- a. Samadhan viheen dukhi daridra
- b. Sadhan viihin dukhi daridra
- c. **Sadhan Viheen Dukhi Daridra**
- d. Sadhan vimukh dukhi daridra

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