
	<p>S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, Recognized by Govt. of Karnataka, Affiliated to VTU Belagavi & Accredited at 'A' Grade by NAAC and Recognized Under Section 2(f) of UGC.</p>	<p>Mech. Engg.</p>
		<p>Course Plan</p>
		<p>VIII (A&B)</p>
		<p>2018-19 (Even)</p>

Department of Mechanical Engineering


COURSE PLAN 2018-19

VIII Semester "A & B" Division

	<p>S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, Recognized by Govt. of Karnataka, Affiliated to VTU Belagavi & Accredited at 'A' Grade by NAAC and Recognized Under Section 2(f) of UGC.</p>	<p>Mech. Engg.</p>
		<p>Course Plan</p>
		<p>VIII (A&B)</p>
		<p>2018-19 (Even)</p>

CONTENTS

Sl. No.	Topic	Page No.
1	Vision and Mission	i
2	PEOs, PSOs and POs	ii
3	Students Help Desk	iii
4	Departmental Resources	iv
5	Teaching Faculty Details	v
6	Academic Calendar	vi
7	Scheme of Teaching & Examination	vii
Theory Course Plan		
1	15ME81 -Operations Research	1-5
2	15ME82- Additive Manufacturing	6-11
3	15ME835- Product life cycle management (Professional Elective–V)	12-17
Laboratory – Course Plan and Viva Questions		
4	15ME84- Internship / Professional Practice	
5	15ME85- Project Phase – II	
6	15MES86- Seminar	

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		Course Plan
		VIII (A&B)
		2018-19 (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, educating them in a state-of-the-art-infrastructure, by retaining the best practices, people 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 OF MECHANICAL ENGINEERING

VISION

“To be the centre of excellence in providing education in the field of Mechanical Engineering to produce technically competent and socially responsible engineering graduates”

MISSION

“Educating students to prepare them for professional competencies in the broader areas of the Mechanical Engineering field by inculcating analytical skills, research abilities and encouraging culture of continuous learning for solving real time problems using modern tools”

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Program Educational Objectives (PEOs)

The Graduates will be able to


- PEO1:** Acquire core competence in Applied Science, Mathematics and Mechanical Engineering fundamentals to excel in professional career and higher study
- PEO2:** Design, demonstrate and analyze the mechanical systems which are useful to society.
- PEO3:** Maintain professional & ethical values, employability skills, multidisciplinary approach & an ability to realize engineering issues to broader social context by engaging in lifelong learning.

Program Specific Outcomes (PSOs)

- PSO1:** Able to apply the basic principles of Mechanical Engineering in various practical fields to solve societal problems by engaging themselves in many state/national level projects.
- PSO2:** Able to analyze and design basic mechanical system using relevant tools and techniques.
- PSO3:** Able to resolve contemporary issues of industries through industry institute interaction and alumni social networks


Program Outcomes (POs)

- PO1: Engineering knowledge-** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2: 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.
- PO3: 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.
- PO4: 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.
- PO5: 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.
- PO6: 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.
- PO7: 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.
- PO8: Ethics-** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9: Individual and team work-** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10: 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.
- PO11: 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.
- PO12: 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.

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Student Help Desk

S. N	Purpose	Contact Person	
		Faculty	Instructor
Department Level			
1	Attestations	Dr. B. M. Shrigiri	
2	Online submission of exam form/revaluation form to VTU	Prof. S. B. Awade / Prof. N. M. Ukkali / Prof. M. R. Ingalagi	--
3	Students' Counseling & Discussion with parents (Class Teachers from 4 th A to 8 th B)	Prof. M.I.Tanodi Prof. G.V.Chiniwalar Prof. M.M.Shivashimpi Prof. A.M.Biradar Prof.S.R.Kulkarni Prof. G.A.Naik	
4	Department Association Coordinator	Prof. M. M. Shivashimpi/ Prof. M. R. Ingalagi	Shri.M.B.Badiger
5	Students Activities Coordinator	Prof. Jagadeesh A.	
6	Extra-Curricular Activities/ Induction/ Robo Vidya	Prof. T. S. Vandali / Prof. A.M.Biradar/Prof.N.M.Ukkali	
7	Dept.TP Cell Coordinator	Prof. R. V. Nyamagoud	Shri S. R. Nakade
8	I I I coordinator, (INTERNSHIP)	Prof. Chitagopkar Ravi	Shri R. B. Kumbar
9	I I I coordinator (INDUSTRY)	Prof. G. A. Naik	
10	Time Table Coordinator	Prof. G. V. Chiniwalar	
11	I. A. Test Coordinator	Prof.S.B.Awade/Prof. A. M. Biradar	Shri S. C. Jotawar Shri R. M. Hunachyali
12	Choice of Electives	Prof. S. N. Toppannavar Prof. D. N. Inamdar Prof. T. S. Vandali	---
13	Department Library Coordinator	Prof. Mahantesh I Tanodi	Shri R. M. Hunachyali
14	Department News Letter Coordinator	Prof. M. M. Shivashimpi/ Prof. S. R. Kulkarni/ Prof. M. R. Ingalagi	
15	Department Technical Magazine Coordinator	Prof. M. S. Futane/ Prof. D. N. Inamdar/ Prof. S. R. Kulkarni	
16	Dept. Alumni	Prof. Mahesh Hipparagi	
17	Project and Technical seminar Coordinators	Prof. Mahantesh I. Tanodi	Shri R. B. Kumbar / Shri.M.S.Kurni
18	Dispensary	Dr. Arun G. Bullannavar	Cell No. 9449141549
Institute Level			
01	Student Welfare Convener	Prof. R.R.Patil(9845455422)	
02	TP Cell Coordinator	Prof. Santosh Sajjan (9480849332)	
03	Anti Ragging Convener	Prof. M. S. Futane (9480849334)	
04	Anti Squad Convener	Prof. K. M. Akkoli (9739114856)	
05	Anti Sexual Harassment Convener	Smt. S.S.Kamate (9008696825)	
06	Grievance Redressal Convener	Prof. S.S.Tabaj (9901398134)	
07	Institute News & publicity	Prof. Mahesh Hipparagi (7411507405)	
08	First Year Coordinator	Dr. R. M. Galagali (9945082054)	

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		2018-19 (Even)

Departmental Resources


Department of Mechanical Engineering was established in the year 1996 and is housed in a total area of **2584.5 Sq. Meters**.

Faculty Position

Sl. No.	Category	No. in position	Average experience
1	Teaching faculty	25	16
2	Technical staff	11	13
3	Helper / Peons	05	08

Major Laboratories

S.N.	Name of the laboratory	Area in Sq. Meters	Amount Invested (Rs.)
1	Basic Workshop Laboratory	170	427698.00
2	Fluid Mechanics Machinery Laboratory	172	775316.75
3	Energy Conversion Engg. Laboratory	173	1269190.20
4	Machine shop Laboratory	170	1361344.50
5	Foundry & Forging Laboratory	179	318787.11
6	Design Laboratory	73	364998.00
7	Heat & Mass Transfer Laboratory	148	524576.00
8	Material Testing Laboratory	149	1085747.94
9	Mechanical Measurements & Metrology Laboratory	95	548011.75
10	CIM & Automation/CAMA Laboratory	66	3720223.10
11	Computer Aided Machine Drawing Laboratory	66	2013811.50
12	Computer Aided Engg Drawing Laboratory	66	1427271.30
13	Department/Other	--	1865338.70
	Total	1527	1,57,02,314.90

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Teaching Faculty Details

S.N.	Faculty Name	Designation	Qualification	Area of specialization	Professional membership	Industry Experience (in years)	Teaching Experience (in years)	Contact Nos.
1	Dr. S. C. Kamate	Principal	Ph. D	Thermal(Cogeneration)	LMISTE	03	25	9480849331
2	Dr. S. A. Alur	Professor	Ph. D	Thermal Power Engg.	LMISTE	---	23	9686856029
3	Dr. B M Shrigiri	HOD/Professor	Ph. D	Thermal Power Engg.	LMISTE	01	19	9741483339
4	Dr. R. M. Galagali	Assoc.Professor	M Tech., Ph.D	PDM, Tribology	----	02	17	9945082054
5	Prof.S.N.Topannavar	Assoc.Professor	M Tech.(Ph.D)	Thermal Power Engg.	LMISTE	01	17	9482440235
6	Prof. D. N. Inamdar	Asso.Professor	M Tech.(Ph.D)	Tool Engg	LMISTE	08	13	9591208980
7	Prof. K. M. Akkoli	Asso.Professor	M Tech.(Ph.D)	Thermal Power Engg.	LMISTE	1.5	13	9739114856
8	Prof.R.K.Chitgopkar	Asst. Professor	M Tech.	Thermal Power Engg.	LMISTE	1.5	25	9886070475
9	Prof.G. A. Naik	Asst. Professor	M Tech.	Production Management	LMISTE	02	20	9480539283
10	Prof. G. V. Chiniwalar	Asst. Professor	M Tech.	Machine Design	LMISTE	04	13	8762336434
11	Prof.M.S.Futane	Asst. Professor	M Tech.	Computer Integrated Manufacturing	LMISTE	01	11	9164105035
12	Prof. T. S. Vandali	Asst. Professor	M Tech.	Machine Design	LMISTE	8.5	07	9686235904
13	Prof.S. A. Goudadi	Asst. Professor	M Tech.	Design Engineering	LMISTE	--	09	9448876682
14	Sri. S.R. Kulkarni	Asst. Professor	M Tech.	Production Management	LMISTE	--	11	8123661692
15	Prof.M.M.Shivashimpi	Asst. Professor	M Tech.(Ph.D)	Thermal Power Engg.	LMISTE	01	07	9742197173
16	Prof.M.A.Hipparagi	Asst. Professor	M Tech.(Ph.D)	Production Technology	LMISTE	02	06	7411507405
17	Prof. A. M. Biradar	Asst. Professor	M Tech.	Machine Design	LMISTE	02	07	9986127703
18	Prof. K. G. Ambli	Asst. Professor	M Tech.(Ph.D)	Product Design and Manufacturing	LMISTE	0.8	05	9164534514
19	Prof. S. B. Awade	Asst. Professor	M Tech.	Machine design	LMISTE		04	9632606108
20	Prof.Mahantesh Tanodi	Asst. Professor	M Tech.	Machine design	LMISTE	--	05	9611998812
21	Prof. N. M. Ukkali	Asst. Professor	M Tech.	Machine Design	LMISTE	--	04	9620152199
22	Prof. M. R. Inagalagi	Asst. Professor	M Tech.	Thermal Power Engg	LMISTE	--	03	9743868503
23	Prof. Jagadeesh A.	Asst. Professor	M Tech.	Thermal Power Engg	LMISTE	--	04	9902847774
24	Prof. R. V. Nyamagoud	Lecturer	M Tech.	Thermal Power Engg	LMISTE	--	03	9964822494
25	Prof. B. M. Dodamani	Asst. Professor	M Tech.	Energy System Engg	LMISTE	02	03	9535447575



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CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2018-19

	S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i> <small>Approved by AICTE, Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi & Recognized Under Section 2(f) of UGC Act, 1956.</small>	IQAC File I-11 2018-19 (Even) Rev: 0
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CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2018-19 (Even)

Date	Events	Calendar																																																	
		February-2019 <table border="1" style="width: 100%; border-collapse: collapse;"> <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></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									
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01-02-2019	Commencement of IV/VI/VIII Semester Classes																																																		
22-02-2019	EDP Activities																																																		
25-02-2019	Commencement of II Semester Classes																																																		
02-03-2019	Annual Sports Meet																																																		
14-03-2019 to 16-03-2019	First Internal Assessment of IV/VI/VIII Semester	March-2019 <table border="1" style="width: 100%; border-collapse: collapse;"> <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> <tr><td>31</td><td></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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20-03-2019	Feed Back-1, Display of First Internal Assessment Marks & Submission of Feedback-1 report to office																																																		
21-03-2019	HIT Quest - 2019																																																		
22-03-2019	HIT SAMBHRAMA-2019																																																		
23-03-2019	Techno-Vision 2019	04- Maha Shivaratri 05- Maha Dusoha 21- Holi																																																	
11-04-2019 to 13-04-2019	Second Internal Assessment of IV/VI/VIII Sem. First Internal Assessment of II Sem.	April-2019 <table border="1" style="width: 100%; border-collapse: collapse;"> <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>1</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></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											
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15-04-2019	Feed Back-2																																																		
18-04-2019	Display of Internal Assessment Marks & Submission of Feedback-1 report to office																																																		
23-04-2019	Technical Activities under Professional Bodies																																																		
26-04-2019	NSS/Red Cross activities	06- Chandraman Ugadi 14- Dr. B. R. Ambedkar Jayanti 17- Mahaveer Jayanti 19- Good Friday																																																	
16-05-2019 to 18-05-2019	Third Internal Assessment of IV/VI/VIII Sem. Second Internal Assessment of II Sem.	May-2019 <table border="1" style="width: 100%; border-collapse: collapse;"> <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>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr> <tr><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td></tr> <tr><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td></tr> <tr><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</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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22-05-2019	Display of Internal Assessment Marks																																																		
20-05-2019 & 21-05-2019	Lab Internal Assessment of IV/VI/VIII Semester																																																		
22-05-2019	Graduation Day - 2019																																																		
23-05-2019	Project Exhibition of VIII Sem.																																																		
23-05-2019	Last Working Day of IV/VI/VIII Semester	01- Labours Day, 07- Basava Jayanthi																																																	
27-05-2019 to 07-06-2019	Practical Exams of IV/VI/VIII Semester																																																		
10-06-2019 to 16-07-2019	Theory Exams of IV/VI/VIII Semester	June -2019 <table border="1" style="width: 100%; border-collapse: collapse;"> <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></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						
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10-06-2019 & 11-06-2019	Lab Internal Assessment of II Sem.																																																		
11-06-2019 to 17-06-2019	Project Viva-Voce of VIII Sem.																																																		
13-06-2019 to 15-06-2019	Third Internal Assessment of II Sem.																																																		
17-06-2019	Last Working Day of II Semester																																																		
19-06-2019 to 29-06-2019	Practical Exams of II Semester	05- Qutub-E-Ramazan																																																	
01-07-2019 to 16-07-2019	Theory Exams of II Semester																																																		
 Dr. Shilpa Shrigiri IQAC Co-ordinator		 Dr. S C Kamate Principal Hirasugar Institute of Technology NIDASOSHI-591 236																																																	



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Course Plan
VIII (A&B)
2018-19 (Even)


	<p style="font-size: small;">S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi & Recognized Under Section 2(f) of UGC Act, 1956.</p>	<p style="font-size: small;">MED Calendar Of Events 2018-19 (Even)</p>
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DEPARTMENT CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2018-19 (Even)

Date	Events	Calendar																																																	
01-02-2019	Commencement of IV/VI/VIII Semester Classes	February-2019 <table border="1" style="width: 100%; text-align: center; font-size: x-small;"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></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></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									
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22-02-2019	Technical Seminar																																																		
23-02-2019	Industrial Visit (VIII Semester)																																																		
14-03-2019 to 16-03-2019	First Internal Assessment of IV/VI/VIII Semester																																																		
09-03-2019	Industrial Visit (VI Semester)	March-2019 <table border="1" style="width: 100%; text-align: center; font-size: x-small;"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></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> <tr><td>31</td><td></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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21-03-2019	HIT Quest - 2019																																																		
30-03-2019	Expert Talk By Industrialist																																																		
05-04-2019	Hobby Project Exhibition	April-2019 <table border="1" style="width: 100%; text-align: center; font-size: x-small;"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></tr> <tr><td></td><td>1</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></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											
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11-04-2019 to 13-04-2019	Second Internal Assessment of IV/VI/VIII Sem.																																																		
27-04-2019	ED Cell Activity																																																		
16-05-2019 to 18-05-2019	Third Internal Assessment of IV/VI/VIII Se	May-2019 <table border="1" style="width: 100%; text-align: center; font-size: x-small;"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></tr> <tr><td></td><td></td><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr> <tr><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td></tr> <tr><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td></tr> <tr><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</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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20-05-2019 & 21-05-2019	Lab Internal Assessment of IV/VI/VIII Semester																																																		
23-05-2019	Project Exhibition of VIII Sem.																																																		
23-05-2019	Last Working Day of IV/VI/VIII Semester																																																		
27-05-2019 to 07-06-2019	Practical Exams of IV/VI/VIII Semester	01- Labours Day																																																	
10-06-2019 to 16-07-2019	Theory Exams of IV/VI/VIII Semester	June -2019 <table border="1" style="width: 100%; text-align: center; font-size: x-small;"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></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></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						
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11-06-2019 to 17-06-2019	Project Viva-Voce of VIII Sem.																																																		
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AIMSS Coordinator
 Prof. M. M. Shivashimpi

HOD
 Dr. B. M. Shrigiri
HOD
Mechanical Engg.
HIT, Nidasoshi

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		Course Plan
		VIII (A&B)
		2018-19 (Even)

Scheme of Teaching and Examination


8th Semester "A&B"

VTU Scheme

Sl. No.	Subject Code	Title	Teaching Hours per week			Examination				Credits
			Lecture	Tutorial	Practical	Duration (hours)	Theory/Practical Marks	IA Marks	Total marks	
1	15ME81	Operation Research	3	2	0	03	80	20	100	4
2	15ME82	Additive Manufacturing	4	0	0	03	80	20	100	4
3	15ME83X	Professional Elective - V	3	0	0	03	80	20	100	3
4	15ME84	Internship / Professional Practice	Industrial Oriented			03	50	50	100	2
5	15ME85	Project Phase – II	-	6	-	03	100	100	200	6
6	15ME86	Seminar	-	4	-	-	-	100	100	1
TOTAL			10	12	-		390	310	700	20

Professional Elective-V	
15ME831	Cryogenics
15ME832	Experimental Stress Analysis
15ME833	Theory of Plasticity
15ME834	Green Manufacturing
15ME835	Product life cycle management

1. **Core Subject:** This is the course, which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.
2. **Professional Elective:** Elective relevant to chosen specialization / branch
3. **Open Elective:** Electives from other technical and/or emerging subject areas.

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			VIII (A&B)
			2018-19 (Even)

Subject Title	OPERATIONS RESEARCH		
Subject Code	15ME81	IA Marks	20
No of Lecture Hrs + Practical Hrs / Week	05	Exam Marks	80
Total No of Lecture + Practical Hrs	50	Exam Hours	03

FACULTY DETAILS:

Name: Prof. S A Goudadi	Designation: Asst. Professor	Experience: 11 Years
No. of times course taught: 05		Specialization: Design Engineering
Name: Prof. N M Ukkali	Designation: Asst. Professor	Experience: 6 Years
No. of times course taught: 02		Specialization: Machine Design

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
1	Mechanical Engineering	I/II/III/IV	Engg Mathematics


2.0 Course Objectives

1. understand the Scope of Operations Research and the Phases of Operations Research
2. understand the role of models in decision making characteristics of a good OR model

3.0 Course Outcomes

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

CO	Course Outcome	Cognitive Level	POs
C417.1	Understand the meaning, definitions, scope, need, phases , techniques of operations research and formulate, derive optimal solutions to linear programming problems by graphical method.	L1 L2	2,3,4,11,12
C417.2	Formulate as L.P.P and derive optimal solutions to linear programming problems by Simplex method, Big-M method and Dual	L1 L2	2,3,4,11,12
C417.3	Formulate as Transportation and Assignment problems and derive optimum solutions for transportation, Assignment and travelling	L1 L2	2,3,4,11,12
C417.4	Construct network diagrams to determine time and cost of projects by PERT & CPM and Analyze the variety of performance measures of a	L1 L2	2,3,4,11,12
C417.5	Select the optimal strategies to solve game theory problems and Evaluate minimum elapsed time with optimal sequence for 'n' jobs on	L1 L2	2,3,4,11,12
Total Hours of instruction			50

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4.0 Course Content

MODULE -1 Introduction: Evolution of OR, Definitions of OR, Scope of OR, Applications of OR, Phases in OR study. Characteristics and limitations of OR, models used in OR,

Linear Programming Problem (LPP), Generalized LPP- Formulation of problems as L.P.P. SolutionstoLPP by graphical method(Two Variables). 08 Hours

MODULE -2 LPP: Simplex method, Canonical and Standard form of LP problem, slack, surplus and artificial variables, Solutions to LPP by Simplex method, Big-M Method and Two Phase Simplex Method, Degeneracy in LPP. Concept of Duality, writing Dual of given LPP. Solutions to L.P.P by Dual Simplex Method. 12 Hours

MODULE -3 Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using North-West Corner rule, Vogel's Approximation method. Optimality in Transportation problem by Modified Distribution(MODI) method. Unbalanced T.P. Maximization T.P. Degeneracy in transportation problems, application of transportation problem.


Assignment Problem-Formulation, Solutions to assignment problems by Hungarian method, Special cases in assignment problems, unbalanced, Maximization assignment problems. Travelling Salesman Problem (TSP). Difference between assignment and T.S.P, Finding best route by Little's method. Numerical Problems. 12 Hours .

MODULE -4 Network analysis: Introduction, Construction of networks, Fulkerson's rule for numbering the nodes, AON and AOA diagrams; Critical path method to find the expected completion time of a project, determination of floats in networks, PERT networks, determining the probability of completing a project, predicting the completion time of project; Cost analysis in networks. Crashingofnetworks- Problems.

Queuing Theory: Queuing systems and their characteristics, Pure-birth and Pure-death models (only equations), Kendall & Lee's notation of Queuing, empirical queuing models – Numerical on M/M/1 and M/M/C Queuing models. 10 Hours

MODULE -5 Game Theory: Definition, Pure Strategy problems, Saddle point, Max-Min and Min-Max criteria, Principle of Dominance, Solution of games with Saddle point. Mixed Strategy problems. Solution of 2X2 games by Arithmetic method, Solution of 2Xn m and mX2 games by graphical method. Formulationof games.

Sequencing: Basic assumptions, Johnson's algorithm, sequencing 'n' jobs on single machine using priority rules, sequencing using Johnson's rule-'n' jobs on 2 machines, 'n' jobs on 3 machines, 'n' jobs on 'm' machines. Sequencing of 2 jobs on 'm' machines using graphical method. 08 Hours **(6 Hours)**

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		VIII (A&B)
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5.0 Relevance to future subjects

SL. No	Semester	Subject	Topics / Relevance
01	VIII	Project	Project Evaluation

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Cost of project

7.0 Books Used and Recommended to Students

Text Books
1. Operations Research, Prem Kumar Gupta, D S Hira, S Chand Pub, New Delhi, 2007
2. Operations Research and Introduction, Taha H. A. – Pearson Education edition
Reference Books
1. Operation Research” A P Verma, S K Kataria & sons, 2008
2. “Operation Research” Paneerselvan, PHI
3. “Operation Research” AM Natarajan, P. Balasubramani, A Tamaravari Pearson 2005
4. Introduction to operation research, Hiller and liberman, Mc Graw Hill. 5th edition 2001.
5. Operations Research, S. D. Sharma –Kedarnath Ramnath & Co 2002.
Additional Study material & e-Books
1. Nptel.ac.in
2. VTU, E- learning

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

Website and Internet Contents References
1. http://www.nptel.ac.in

9.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Annals of Operations Research	http://www.springer.com/business+%26+management/operations+research/journal/10479
2	A journal of Operations Research	http://www.springer.com/business+%26+management/operations+research/journal/41274

10.0 Examination Note

Internal Assessment: 20 Marks

Theoretical aspects as well as relevant sketches should be drawn neatly.

Scheme of Evaluation for Internal Assessment (20 Marks)

(a) Internal Assessment test in the same pattern as that of the main examination (Better of the two Tests):25marks.

SCHEME OF EXAMINATION:


Two questions to be set from each Module.

Student has to answer any five question choosing at least one questions from Each modulr.

SEE = 80 Marks


IA = 20 Marks

Total = 100 Marks

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11.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecturer	% of Portion
1	1	INTRODUCTION: Evolution of OR, definition of OR, scope of OR,.	10
	2	application areas of OR, steps (phases) in OR study, Characteristics and limitations of OR,	
	3	Linear programming L.P. Problem formulation	
	4	Solution by Graphical method	
2	5	LINEAR PROGRAMMING PROBLEMS: The simplex method –canonical and	20
	6	standard form of an LP problem,	
	7	slack, surplus and	
	8	artificial variables	
	9	Big M method and	
	10	Concept of duality,	
3	11	dual simplex method.	20
	12	Problems	
	13	TRANSPORTATION PROBLEM: Formulation of transportation problem, types,	
	14	Initial basic feasible solution using different methods,	
	15	Optimal solution by MODI method,	
	16	Degeneracy in transportation problems,	
	17	Applications of Transportation problem concept for maximization cases.	
	18	Assignment Problem: Formulation, types,	
	19	allocation to maximization cases and	
	20	travelling salesman problem.	
	22	solution of integer programming problems	
	23	GOMMORY'S all integer cutting plane method and	
24	mixed integer method,		
25	branch and bound method,		
26	zero one programming		
4	27	PERT-CPM TECHNIQUES: Introduction,	26
	28	Network construction- rules,	
	29	Fulkerson's rule for numbering the events, AON & AOA diagrams;	
	30	critical path method to find the expected completion time of a project,	
	31	floats for finding duration of an activity and project,	
	32	determining the probability of completing a project,	
	33	predicting the completion time of project;	
	34	crashing of simple networks.	
	35	EUING THEORY: Queuing systems and	
	36	r characteristics.	
	37	e-birth and pure-death models (only equations),	
	38	pirical queuing models-M/M/1 and	
	39	M/C models.	
	40	ady state performance analysis.	
5	41	GAME THEORY: Formulation of games,	24
	42	solution of games with saddle point,	
	43	types,	
	44	Graphical method of solving mixed strategy games,	
	45	dominance rule for solving mixed strategy games,	
	46	Problems	
	47	SEQUENCING: Basic assumptions,	
	48	sequencing n-jobs on single machine using priority rules,	
	49	sequencing using Johnsons rule-n jobs on 2 machines,	
	50	n jobs on 3machines,	
	51	n jobs on m machines using Graphical method.	
	52	Problems	





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		VIII (A&B)
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13.0 Assignments, Pop Quiz, Mini Project, Seminars

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

13.0 University Result

Examination	FCD	FC	SC	% Passing
July 2016-17	61	33	34	96
July 2017-18	29	39	42	95

Prepared by	Checked by		
 Prof. N M Ukkali	 Prof. S A Goudadi	 HOD	 Principal

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Subject Title	ADDITIVE MANUFACTURING		
Subject Code	15ME82	IA Marks	20
No of Lecture Hrs + Practical Hrs / Week	04	Exam Marks	80
Total No of Lecture + Practical Hrs	50	Exam Hours	03
CREDITS – 04			

FACULTY DETAILS:		
Name: Prof. S R Kulkarni	Designation: Asst. Professor	Experience: 11 Years 06 Months
No. of times course taught: 01	Specialization: Production Management	
Name: Prof. Kushal G. Ambli	Designation: Asst. Professor	Experience: 05
No. of times course taught: 01	Specialization: Product Design & Manufacturing	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
1	Mechanical Engineering	III	Manufacturing process I
2	Mechanical Engineering	IV	Manufacturing process II
3	Mechanical Engineering	VII	Computer Integrated Manufacturing

2.0 Course Objectives

1. Understand the additive manufacturing process, polymerization and powder metallurgy process.
2. Understand characterization techniques in additive manufacturing.
3. Acquire knowledge on CNC and Automation.

3.0 Course Outcomes


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

CO	Course Outcome	Cognitive Level	POs
C417.1	Understand the basics of additive manufacturing, methods and applications.	L2	1,4,5,7,10,12
C417.2	Understand and demonstrate the use of different system drives and devices.	L2	1,4,5,7,10,12
C417.3	Understand the basic concepts of Polymer and powder metallurgy.	L2	1,4,5,7,10,12
C417.4	Understand the different characterization techniques.	L2	1,4,5,7,10,12
C417.5	Interpret the various NC, CNC machine programming and Automation techniques.	L2	1,4,5,7,10,12
Total Hours of instruction			50

4.0 Course Content

Module 1

INTRODUCTION TO ADDITIVE MANUFACTURING: Introduction to AM, AM evolution, Distinction between AM & CNC machining, Advantages of AM, AM process chain: Conceptualization, CAD, conversion to STL, Transfer to AM, STL file manipulation, Machine setup, build, removal and clean up, post processing. Classification of AM processes: Liquid polymer system, Discrete particle system, Molten material systems and Solid sheet system. Post processing of AM parts: Support material removal, surface texture improvement, accuracy improvement, aesthetic improvement, preparation for use as a pattern, property, enhancements using non-thermal and thermal techniques. Guidelines for process selection: Introduction, selection methods for a part, challenges of selection AM Applications: Functional models, Pattern for investment and vacuum casting, Medical models, art models, Engineering analysis models, Rapid tooling, new materials development, Bi-metallic parts, Re-manufacturing. Application examples for Aerospace, defense, automobile, Bio-medical and general engineering industries. **10 Hours**

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		2018-19 (Even)

Module 2

SYSTEM DRIVES AND DEVICES: Hydraulic and pneumatic motors and their features, Electrical motors AC/DC and their features, Actuators: Electrical Actuators; Solenoids, Relays, Diodes, Thyristors, Triacs, Hydraulic and Pneumatic actuators, Design of Hydraulic and Pneumatic circuits, Piezoelectric actuators, Shape memory alloys. **8 Hours**

Module 3

POLYMERS & POWDER METALLURGY

Basic Concepts: Introduction to Polymers used for additive manufacturing: polyamide, PF resin, polyesters etc. Classification of polymers, Concept of functionality, Polydispersity and Molecular weight [MW], Molecular Weight Distribution [MWD] Polymer Processing: Methods of spinning for additive manufacturing: Wet spinning, Dry spinning, Biopolymers, Compatibility issues with polymers. Moulding and casting of polymers, Polymer processing techniques General Concepts: Introduction and History of Powder Metallurgy (PM), Present and Future Trends of PM Powder **Production Techniques:** Different Mechanical and Chemical methods, Atomisation of Powder, other emerging processes. **Characterization Techniques:** Particle Size & Shape Distribution, Electron Microscopy of Powder, Interparticle Friction, Compression ability, Powder Structure, Chemical Characterization **Microstructure Control in Powder:** Importance of Microstructure Study, Microstructures of Powder by Different techniques **Powder Shaping:** Particle Packing Modifications, Lubricants & Binders, Powder compaction & Process Variables, Pressure & Density Distribution during Compaction, Isotactic Pressing, Injection Moulding, Powder Extrusion, Slip Casting, Tape Casting. **Sintering:** Theory of Sintering, Sintering of Single & Mixed Phase Powder, Liquid Phase Sintering **Modern Sintering Techniques,** Physical & Mechanical Properties Evaluation, Structure-Property Correlation Study, Modern Sintering techniques, Defects Analysis of Sintered Components **Application of Powder Metallurgy:** Filters, Tungsten Filaments, Self-Lubricating Bearings, Porous Materials, Biomaterials etc. **12 Hours**

Module 4


NANO MATERIALS & CHARACTERIZATION TECHNIQUES:

Introduction: Importance of Nano-technology, Emergence of Nanotechnology, Bottom up and Top-down approaches, challenges in Nanotechnology **Nano-materials Synthesis and Processing:** Methods for creating Nanostructures; Processes for producing ultrafine powders- Mechanical grinding; Wet Chemical Synthesis of Nano-materials- sol-gel process; Gas Phase synthesis of Nano-materials-Furnace, Flame assisted ultrasonic spray pyrolysis; Gas Condensation Processing (GPC), Chemical Vapour Condensation(CVC). **Optical Microscopy - principles,** Imaging Modes, Applications, Limitations. **Scanning Electron Microscopy (SEM) - principles,** Imaging Modes, Applications, Limitations. **Transmission Electron Microscopy (TEM) - principles,** Imaging Modes, Applications, Limitations. **X- Ray Diffraction (XRD) - principles,** Imaging Modes, Applications, Limitations. **Scanning Probe Microscopy (SPM) - principles,** Imaging Modes, Applications, Limitations. **Atomic Force Microscopy (AFM) - basic principles,** instrumentation, operational modes, Applications, Limitations. **Electron Probe Micro Analyzer (EPMA) - Introduction,** Sample preparation, Working procedure, Applications, Limitations. **10 Hours**

Module 5

MANUFACTURING CONTROL AND AUTOMATION

CNC technology - An overview: Introduction to NC/CNC/DNC machine tools, Classification of NC /CNC machine tools, Advantage, disadvantages of NC /CNC machine tools, Application of NC/CNC Part programming: CNC programming and introduction, Manual part programming: Basic (Drilling, milling, turning etc.), Special part programming, Advanced part programming, Computer aided part programming (APT) **Introduction:** Automation in production system principles and strategies of automation, basic Elements of an automated system. **Advanced Automation functions.** Levels of Automations, introduction to automation productivity **Control Technologies in Automation:** Industrial control system. Process industry vs discrete manufacturing industries. Continuous vs discrete control. Continuous process and its forms. Other control system components. **10 Hours**

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		Course Plan
		VIII (A&B)
		2018-19 (Even)

5.0 Relevance to future subjects/Area

SL. No	Semester	Subject	Topics / Relevance
01	M Tech	Rapid Prototyping	3D printing technologies

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Industry, Educational institutions, Public and Private sectors and Government Organizations

7.0 Books Used and Recommended to Students

Text Books
1. Chua Chee Kai, Leong Kah Fai, "Rapid Prototyping: Principles & Applications", World Scientific, 2003. 2. G Odian Principles of Polymerization, Wiley Inerscience John Wiley and Sons, 4th edition,2005 3. Mark James Jackson, Microfabrication and Nanomanufacturing, CRC Press, 2005. 4. Powder Metallurgy Technology, Cambridge International Science Publishing, 2002. 5. P. C. Angelo and R. Subramanian: Powder Metallurgy- Science, Technology and Applications, PHI, New Delhi, 2008. 6. Mikell P Groover, Automation, Production Systems and Computer Integrated Manufacturing, 3rd Edition, Prentice Hall Inc., New Delhi, 2007.
Reference Books
1. Wohler's Report 2000 - Terry Wohlers - Wohler's Association -2000 2. Computer Aided Manufacturing - P.N. Rao, N.K. Tewari and T.K. Kundra Tata McGraw Hill 1999 3. Ray F. Egerton , Physical Principles of Electron Microscopy: An Introduction to TEM, SEM,and AEM , Springer, 2005. 4. P. C. Angelo and R. Subramanian: Powder Metallurgy- Science, Technology and Applications, PHI, New Delhi, 2008.
Additional Study material & e-Books
<ul style="list-style-type: none"> • Nptel.ac.in • VTU, E-learning • MOOCs • Open course ware

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

Website and Internet Contents References
<ul style="list-style-type: none"> • http://www.nptel.ac.in

9.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	<u>Additive</u> Manufacturing	https://www.journals.elsevier.com/additive-manufacturing


10.0 Examination Note

Internal Assessment: 20 Marks

Theoretical aspects as well as relevant sketches should be drawn neatly for questions asked in Internal Assessments

Scheme of Evaluation for Internal Assessment

Internal Assessment test in the same pattern as that of the main examination (Better of the two Tests):20marks.

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SCHEME OF EXAMINATION:


There are five modules two questions from each module

Student has to answer any five question choosing at least one questions from each module.

Max. Marks: 80Marks

11.0 Course Delivery Plan


Unit No.	Lecture No.	Content of Lecture	% of Portion
1	1	Introduction to Additive Manufacturing: Introduction to AM, AM evolution, Distinction between AM & CNC machining, Advantages of AM	22%
	2	AM process chain: Conceptualization, CAD, conversion to STL, Transfer to AM, STL file manipulation, Machine setup, build , removal and clean up, post processing.	
	3	Classification of AM processes: Liquid polymer system, Discrete particle system, Molten material systems and Solid sheet system	
	4	Post processing of AM parts: Support material removal, surface texture improvement, accuracy improvement, aesthetic improvement, preparation for use as a pattern, property, enhancements using non-thermal and thermal techniques	
	5	Guidelines for process selection: Introduction, selection methods for a part, challenges of selection	
	6	AM Applications: Functional models, Pattern for investment and vacuum casting, Medical models, art models,	
	7	Engineering analysis models, Rapid tooling, new materials development,	
	8	Bi-metallic parts, Re-manufacturing. Application	
	9	examples for Aerospace, defense, automobile,	
	10	Bio-medical and general engineering industries.	
2	11	System Drives and devices: Hydraulic motors and their features	38%
	12	System Drives and devices: pneumatic motors and their features	
	13	Electrical motors AC/DC and their features	
	14	Actuators: Electrical Actuators; Solenoids, Relays	
	15	Diodes, Thyristors, Triacs	
	16	Hydraulic and Pneumatic actuators	
	17	Design of Hydraulic and Pneumatic circuits,	
	18	Piezoelectric actuators, Shape memory alloys.	
3	19	POLYMERS & POWDER METALLURGY Basic Concepts: Introduction to Polymers used for additive manufacturing: polyamide.	60%
	20	PF resin, polyesters etc. Classification of polymers, Concept of functionality, Polydispersity and Molecular weight [MW], Molecular Weight Distribution [MWD]	
	21	Polymer Processing: Methods of spinning for additive manufacturing: Wet spinning, Dry spinning. Biopolymers, Compatibility issues with polymers. Moulding and casting of polymers, Polymer processing techniques	
	22	General Concepts: Introduction and History of Powder Metallurgy (PM), Present and Future Trends of PM	
	23	Powder Production Techniques: Different Mechanical and Chemical methods, Atomisation of Powder, other emerging processes.	
	24	Characterization Techniques: Particle Size & Shape Distribution, Electron Microscopy of Powder, Interparticle Friction, Compression ability, Powder Structure, Chemical Characterization	
	25	Microstructure Control in Powder: Importance of Microstructure Study, Microstructures of Powder by Different techniques Powder Shaping: Particle Packing Modifications, Lubricants & Binders, Powder compaction & Process Variables,	
	26	Pressure & Density Distribution during Compaction, Isotactic Pressing, Injection Moulding, Powder Extrusion, Slip Casting, Tape Casting	
	27	Sintering: Theory of Sintering, Sintering of Single & Mixed Phase Powder, Liquid Phase Sintering Modern Sintering Techniques,	
	28	Physical & Mechanical Properties Evaluation, Structure-Property Correlation Study,	

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		Course Plan
		VIII (A&B)
		2018-19 (Even)

	29	Modern Sintering techniques, Defects Analysis of Sintered Components	
	30	Application of Powder Metallurgy: Filters, Tungsten Filaments, Self-Lubricating Bearings, Porous Materials, Biomaterials etc.	
4	31	NANO MATERIALS & CHARACTERIZATION TECHNIQUES: Introduction: Importance of Nano-technology,	80%
	32	Emergence of Nanotechnology, Bottom up and Top-down approaches, challenges in Nanotechnology	
	33	Nano-materials Synthesis and Processing: Methods for creating Nanostructures; Processes for producing ultrafine powders- Mechanical grinding;	
	34	Wet Chemical Synthesis of Nano-materials- sol-gel process; Gas Phase synthesis of Nano-materials-Furnace	
	35	Flame assisted ultrasonic spray pyrolysis; Gas Condensation Processing (GPC), Chemical Vapour Condensation(CVC).	
	36	Optical Microscopy - principles, Imaging Modes, Applications, Limitations. Scanning Electron Microscopy (SEM) - principles, Imaging Modes, Applications, Limitations.	
	37	Transmission Electron Microscopy (TEM) - principles, Imaging Modes, Applications, Limitations. X- Ray Diffraction (XRD) - principles, Imaging Modes, Applications, Limitations.	
	38	Scanning Probe Microscopy (SPM) - principles, Imaging Modes, Applications, Limitations.	
	39	Atomic Force Microscopy (AFM) - basic principles, instrumentation, operational modes, Applications, Limitations.	
	40	Electron Probe Micro Analyzer (EPMA) - Introduction, Sample preparation, Working procedure, Applications, Limitations.	
	5	41	
42		Advantage, disadvantages of NC /CNC machine tools, Application of NC/CNC Part programming: CNC programming and introduction, Manual part programming: Basic (Drilling, milling, turning etc.),	
43		Special part programming, Advanced part programming, Computer aided part programming (APT)	
44		Introduction: Automation in production system principles and strategies of automation,	
45		basic elements of an automated system. Advanced Automation functions	
46		Levels of Automations, introduction to automation productivity	
47		Control Technologies in Automation: Industrial control system.	
48		Process industry vs discrete manufacturing industries	
49		Continuous vs discrete control. Continuous process and its forms.	
50		Other control system components.	

12.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected: students able to	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	<i>Assignment -1:</i> Introduction to Additive Manufacturing	Understand the basics of additive manufacturing, methods and applications.	Module 1	2	Individual Activity.	Text Book
2	<i>Assignment-2:</i> System Drives and devices	Understand and demonstrate the use of different system drives and devices.	Module 2	4	Individual Activity.	Text Book

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			Course Plan
			VIII (A&B)
			2018-19 (Even)

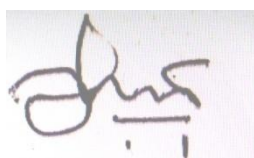
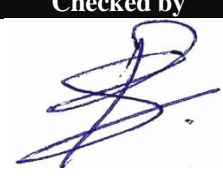


3	Assignment-3: Polymers & Powder Metallurgy	Understand the basic concepts of Polymer and powder metallurgy	Module 3	6	Individual Activity.	Text Book
4	Assignment-4: Nano Materials & Characterization Techniques	Understand the different characterization techniques.	Module 4	8	Individual Activity.	Text Book
5	Assignment-5: Manufacturing Control And Automation	Interpret the various NC, CNC machine programming and Automation techniques.	Module 5	10	Individual Activity.	Text Book


13.0 Question Bank

Sample Questions	Questions
1.	Define AM and Explain liquid polymer system
2.	Explain post processing of parts in detail
3.	Explain the guidelines for process selection and mention any five application of AM
4.	Highlight the features of hydraulic motors
5.	Explain any two actuators 1) Solenoid 2) Triacs 3) Pneumatic actuators
6.	Explain shape memory alloys in detail
7.	Explain wet spinning method of polymer processing
8.	Explain any one powder production technique
9.	Write a short note on sintering and mention applications of powder metallurgy
10.	Define nano materials and explain nano material furnace
11.	Explain principles of optical microscopy, mention limitations and applications
12.	Explain principles of atomic force microscopy, mention limitations and applications
13.	Classify NC/CNC machine tools , mention advantages and disadvantages
14.	What is part programming? Explain with an example
15.	Write differences between continuous vs discrete control.

14.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
2018-19	Subject introduced for the first time							

Prepared by	Checked by		
			
Prof. S. R. Kulkarni	Prof. K. G Ambli	HOD	Principal

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			Course Plan
			VIII (A&B)
			2018-19 (Even)

Subject Title	PRODUCT LIFE CYCLE MANAGEMENT		
Subject Code	15ME835	IA Marks	20
No of Lecture Hrs + Tutorials Hrs / Week	03 L	Exam Marks	80
Total No of Lecture + Tutorial Hrs	40	Exam Hours	03
CREDITS – 03			

FACULTY DETAILS:			
Name : Prof. B M Dodamani	Designation : Asst. Professor	Experience : 05 Years	
No. of times course taught: 01		Specialization: Energy Systems Engineering	
Name: Prof. Jagadeesh A	Designation: Assistant Professor	Experience: 06 Years	
No. of times course taught: 01		Specialization: Thermal Power Engineering	

1.0 Prerequisite Subjects

Sl. No	Branch	Semester	Subject
1	Mechanical Engineering	V	Management & Entrepreneurship


2.0 Course Objectives

1. Familiarize with various strategies of PLM
2. Understand the concept of product design and simulation.
3. Develop New product development, product structure and supporting systems
4. Interpret the technology forecasting and product innovation and development in business processes.
5. Understand product building and Product Configuration.

3.0 Course Outcomes

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

CO	Course Outcome	Cognitive Level	POs
C422.1	Explain the various strategies of PLM and Product Data Management	L1,L4	PO1,P02,P04, PO6.P07,PO12
C422.2	Describe decomposition of product design and model simulation	L4	PO1,P02,P04, PO7,PO12
C422.3	Apply the concept of New Product Development and its structuring.	L4	PO1,P02,P04, PO7,PO12
C422.4	Analyze the technological forecasting and the tools in the innovation.	L3	PO1,P02,P04, PO6.P07,PO12
C422.5	Apply the virtual product development and model analysis	L2,L4	PO1,P02,PO3, PO6,PO12
Total Hours of instruction		40 Hours	

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		Course Plan
		VIII (A&B)
		2018-19 (Even)

4.0 Course Content

MODULE 1:

INTRODUCTION TO PLM AND PDM

Introduction to PLM, Need for PLM, opportunities and benefits of PLM, different views of PLM, components of PLM, phases of PLM, PLM feasibility study. PLM Strategies, strategy elements, its identification, selection and implementation. Product Data Management, implementation of PDM systems. 8Hrs

MODULE 2:

PRODUCT DESIGN

Engineering design, organization and decomposition in product design, product design process, methodical evolution in product design, concurrent engineering, design for 'X' and design central development model. Strategies for recovery at end of life, recycling, human factors in product design. Modeling and simulation in product 8Hrs.

MODULE 3:

PRODUCT DEVELOPMENT

New Product Development, Structuring new product development, building decision support system, Estimating market Opportunity Modulates for new product, new product financial control, implementing new product development, market entry decision, launching and tracking new product program. Concept of redesign of product. 8Hrs.

MODULE 4:

TECHNOLOGY FORECASTING

Technological change, methods of technology forecasting, relevance trees, morphological methods, flow diagram and combining forecast of technologies Integration of technological product innovation and product development in business processes within enterprises, methods and tools in the innovation process according to the situation, methods and tools in the innovation process according to the situation. 8Hrs.

MODULE 5:

PRODUCT BUILDING AND STRUCTURES

Virtual product development tools for components, machines, and manufacturing plants: 3D CAD systems, digital mock-up, model building, model analysis, production (process) planning, and product data technology, Product structures: Variant management, product configuration, material master data, product description data, Data models, Life cycles of individual items, status of items. 8Hrs

5.0 Relevance to future subjects


SL. No	Semester	Subject	Topics / Relevance
01	VII	Total Quality Management	Industry

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Management of any Industry
02	Life cycle management of products
03	Concepts of Knowledge management

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Solving the unsolved problems from the reference and text books and demonstration in laboratory
02	Nptel.ac.in	E- Learning
03	VTU, E- learning	E- Learning
04	MOOCS	E- Learning
05	Open courseware	E- Learning

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		Course Plan
		VIII (A&B)
		2018-19 (Even)

8.0 Books Used and Recommended to Students

Text Books
<ol style="list-style-type: none"> 1. Stark, John. Product Lifecycle Management: Paradigm for 21st Century Product Realisation, Springer-Verlag, 2004. ISBN 1852338105. 2. Fabio Giudice, Guido La Rosa, Product Design for the environment-A life cycle approach, Taylor & Francis 2006
Reference Books
<ol style="list-style-type: none"> 1. Saaksvuori Antti / Immonen Anselmie, product Life Cycle Management Springer, Dreamtech, 3-540-25731-4. 2. Product Lifecycle Management, Michael Grieves, Tata McGraw Hill
Additional Study material & e-Books
<ul style="list-style-type: none"> • Nptel.ac.in • VTU, E- learning • MOOCS • Open courseware

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

Website and Internet Contents References
<ol style="list-style-type: none"> 1. Nptel.ac.in 2. VTU, E- learning 3. http://www.sjbit.edu.in/sjbit-downloads.html 4. http://auto.howstuffworks.com

10.0 Magazines/Journals Used and Recommended to Students


Sl.No	Magazines/Journals	website
1	_Quickmba	http://www.quickmba.com/marketing/product/lifecycle/
2	Product lifecycle management journal	www.ibm.com/Product/Development

11.0 Examination Note

Internal Assessment: (15 marks for I.A. + 05 marks for assignment) = 20 Marks


SCHEME OF EXAMINATION:

Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

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		VIII (A&B)
		2018-19 (Even)

12.0 Course Delivery Plan

Unit No.	Lecture No.	Content of Lecturer	% of Portion
1	1.	Introduction to Product Life Cycle Management(PLM) Definition, PLM Lifecycle model, Threads of PLM	20%
	2.	Need for PLM, Opportunities and benefits of PLM, Views,	
	3.	Components and Phases of PLM,	
	4.	PLM feasibility study	
2	5.	Engineering design, organization and decomposition in product design	40%
	6.	Product design process	
	7.	Methodical evolution in product design	
	8.	Concurrent engineering, design for 'X' and design central development model	
	9.	Strategies for recovery at end of life	
	10.	Recycling, human factors in Product design	
3	11.	Modelling and simulation in product	60%
	12.	New product development	
	13.	Structuring new product development	
	14.	Building decision support system	
	15.	Estimating market opportunities for new Product,	
	16.	New product financial control, implementing new product development	
	17.	Market entry decision,	
	18.	Launching and tracking new product program.	
	19.	Concept of redesign of product	
	20.	Technological change, methods of technology forecasting	
4	21.	Relevance trees, morphological methods	80%
	22.	Flow diagram and combining forecast of Technologies	
	23.	Integration of technological product innovation	
	24.	And product development in business processes	
	25.	Within enterprises, methods	
	26.	And tools in the innovation	
5	27.	Process according to the situation	100%
	28.	Methods and tools in the innovation	
	29.	Process according to the situation	
	30.	Virtual product development tools for components	
	31.	Machines, and manufacturing plants:	
	32.	3D CAD systems	
	33.	Digital mock-up, model building	
	34.	Model analysis, production (process) planning	
	35.	And product data technology	
	36.	Product structures	
	37.	Variant management, product	
	38.	Configuration, material master data,	
	39.	Product description data,	
	40.	Data models, Life cycles of individual items, status of items.	


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		VIII (A&B)
		2018-19 (Even)

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected: students able to	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	The seminar will be conducted on uncovered portion of the subject after the II IA and evaluated the activity.					


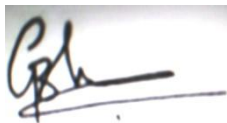


14.0 QUESTION BANK

Sample Questions	Questions
I	Module 1. Introduction to PLM and PDM <ol style="list-style-type: none"> 1. Define PLM 2. Explain briefly the life cycle model. 3. List the threads of PLM and explain in brief. 4. Discuss the need of PLM. 5. What are the benefits of PLM? 6. Explain the components of PLM 7. List the applications of PLM. 8. Write a note on PLM feasibility study 9. Explain the characteristics of PLM. 10. Write a short note on external drivers of PLM. 11. Explain briefly the following internal drivers of PLM a) Productivity b) Innovation c) Collaboration d) Quality 12. What are the elements of PLM? Explain
II	Module 2. Product Design <ol style="list-style-type: none"> 1. Define PDM. 2. What is the importance of PDM systems? 3. What are the reasons for implementation? 4. Explain clearly the check in and checkout concepts? 5. Explain the different strategies for a recovery at the end of life of product.
III	Module 3. Product Development <ol style="list-style-type: none"> 1. Explain in brief new product development. 2. Explain market opportunities. 3. Explain how to implement new product. 4. Explain launching and tracking new product program. 5. Explain the concept of redesign of a product.
IV	Module 4. Technology Forecasting. <ol style="list-style-type: none"> 1. Explain relevance trees. 2. Explain flow diagram by combining forecast technology. 3. What are the methods and tools in innovation process? 4. Write a short on creation of an acrobat 3D document.
V	Module 5. Product Building and Structure <ol style="list-style-type: none"> 1. Explain parameterization of design in detail. 2. Explain the concept of extended product and services 3. Write a short on a) Publication b) Parameters 4. How the optimization of product is done? Explain 5. What is design table configuration? Define digital manufacturing. 6. What are the benefits of DM? 7. What are the applications of digital manufacturing? 8. Explain the following a) manufacturing the first one b) ramp up 9. With a neat graph explain the virtual learning curve.

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		Course Plan
		VIII (A&B)
		2018-19 (Even)

15.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing

Prepared by	Checked by		
			
Prof. Jagadeesh A	Prof. B.M. Dodamani	HOD	Principal