**LOK NAYAK JAIPRAKASH INSTITUTE OF TECHNOLOGY CHAPRA, BIHAR**

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**COURSE FILE**

**OF**

**COMPUTER AIDED DESIGN AND MANUFACTURING (021730)**

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**SACHINDRA KUMAR**

**ASST. PROFESSOR,**

**DEPARTMENT OF MECHANICAL ENGINEERIN**

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**Vision and Mission of Mechanical Engineering Department**

**Vision**

The Mechanical Engineering department visions to be known globally in the field of technical education and to overcome the issues of industry and society.

**Mission**

1. To deliver outcome based education to undergraduate students
2. To establish an environment for students where they can build professional and personal integrity to pursue long productive career.
3. To maintaining state of the art research facilities to provide collaborative environment that stimulates faculty, staff and students with opportunities to create, analyze, apply and disseminate knowledge.
4. To equip students with good academic, corporate and entrepreneurship skills as well as create global awareness in them required by engineering profession

**Program Educational Objectives**

1. To prepare the students for successful career in industries, entrepreneurship or in higher studies.(Preparation)
2. To inculcate engineering attitude to analyze, design and solve real life engineering problems.(Core knowledge)
3. To promote the students for continuous learning, with strong professionals, ethical and moral values.(Learning Environment)

**Program Specific Outcomes**

The graduates of Bachelor of Engineering in Mechanical Engineering Programme will be able to:

1. Design and develop mechanical as well as inter disciplinary components by experimental, numerical and analytical techniques
2. Apply their knowledge from field of mathematics and science fields to solve problems related to mechanical engineering.

**Program Outcomes**

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

Social, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**12. Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Mechanical Engineering Student Outcomes**

Students who complete the B.TECH degree in ME will be able to:

1. An ability to apply the knowledge of mathematics, basic sciences and engineering concepts to solve the complex engineering problems.

2. The ability to conduct experiments and to critically analyze and interpret the experimental data to reach at substantial outcomes.

3. An ability to design systems, components, or processes to meet appropriate needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

4. An ability to identify, formulates, and solves the complex engineering problems.

5. An ability to function on multi-disciplinary teams that leads the ultidisciplinary projects.

6. An understanding of professional and ethical responsibility.

7. An ability to communicate effectively with written, oral, and visual means.

8. An ability to understand the impact of engineering solutions in a global, environmental, economic and societal context.

9. An ability to recognize the need to engage in life-long learning.

10. An ability to attain knowledge of contemporary issues.

11. An ability to use the techniques, skills, and modern tools necessary for Mechanical engineering practice.

12. Possess ability to estimate costs, estimate quantities and evaluate materials for design and manufacturing purposes.

|  |  |
| --- | --- |
| **Course Name** | **CAD/CAM [ME1730]**  **Year : Third Year / Seven Semester** |
| **CO1** | Explain the automation and flexible manufacturing systems. |
| **CO2** | Perform transformations in 2D and 3D objects. |
| **CO3** | Understand various applications of CAD such as computer aided part programming and computer aided process planning. |
| **CO4** | Recognize part families and group technology |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 3 | 2 | 1 | 2 | 1 | 1 | - | - | 1 | 1 |
| **CO2** | 3 | 3 | 3 | 3 | - | 2 | - | 1 | - | - | - | 1 |
| **CO3** | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 |
| **CO4** | 3 | 3 | 3 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 2 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |
| --- | --- | --- |
| **CO** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 |
| **CO2** | 2 | 2 |
| **CO3** | 3 | 2 |
| **CO4** | 2 | 2 |
|  |  |  |

**Course Name:** Computer Aided Design and Manufacturing

**Course Objectives:** The course content enables students to

1. Understand the computer application in the field of mechanical design and manufacturing

2. Able to learn various codes and programs used in part-programming of CAD/CAM software

3. Able to differentiate between NC, CNC and DNC programming

4. Learn about Anti Virus Guard (AVG)

|  |  |
| --- | --- |
| **SYLLABUS** | |
| **COMPUTER AIDED DESIGN & MANUFACTURING** | |
| **L-T-P : 3-0-2** | **Credit : 4** |
| **Unit** Introduction concept of CAD/CAM. | |
| **Unit-2** | Computer system, Hardware in computer – Aided Design system, Product cycle |
| Automation, part programming. | |
| **Unit-3** | Computer aided design system software, Transformation, geometric modeling, Drafting |
| applications | |
| **Unit-4** | CAD/CAM technology to finite element data preparation, concept of data structures |
| **Unit-5** | NC, CNC, DNC programming |

**TIME TABLE**

**7th SEMESTER Mechanical Engineering**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **10:00-10:50** | **10:50-11:40** | **11:40-12:30** | | **12:30-01:20** | | **01:20-02:00** | **02:00-02:50** | **02:50-03:40** | | **03:40-04:30** |
| **MON** |  |  | CAD | |  | | L  U  N  C  H |  | |  |  |
| **TUE** |  |  |  | |  | |  |  | |  |
| **WED** |  |  | |  | |  | CAD LAB | | | |
| **THUY** |  |  | CAD | |  | |  | |  |  |
| **FRI** |  |  |  | |  | |  |  | |  |
| **SAT** | CAD |  |  | |  | | CAD LAB | | | |

**List of Students (7th semester)**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Name of Student** | **Registration No.** |
| 1 | **AMIT KUMAR RAJ** | **17102117001** |
| 2 | **ARPIT KUMAR** | **17102117002** |
| 3 | **AYUSH KUMAR** | **17102117003** |
| 4 | **SHIVCHARAN KUMAR** | **17102117004** |
| 5 | **FAIZ AHMAD** | **17102117005** |
| 6 | **MD REZAUR RAHMAN** | **17102117006** |
| 7 | **SHIV SHANKAR** | **17102117007** |
| 8 | **ASHISH KUMAR** | **17102117008** |
| 9 | **GITESH KUMAR SHARMA** | **17102117009** |
| 10 | **DEEPAK KUMAR** | **17102117010** |
| 11 | **VIKKI KUMAR** | **17102117011** |
| 12 | **ABHISHEK KUMAR TIWARI** | **17102117012** |
| 13 | **JITENDRA KUMAR** | **17102117013** |
| 14 | **GURIYA KUMARI** | **17102117014** |
| 15 | **ASMITA ARYA** | **17102117015** |
| 16 | **SIDHARTH KUMAR** | **17102117016** |
| 17 | **AMIT RANJAN** | **17102117017** |
| 18 | **ARYAN RAJ** | **17102117018** |
| 19 | **AJEET KUMAR PRASAD** | **17102117019** |
| 20 | **AMIT KUMAR** | **17102117020** |
| 21 | **SHRINARAYAN PRASAD** | **17102117021** |
| 22 | **MD ATIQULLAH KHAN** | **17102117022** |
| 23 | **SUDISH KUMAR** | **17102117023** |
| 24 | **MITHILESH KUMAR** | **17102117024** |
| 25 | **SUMIT KUMAR SHARMA** | **17102117025** |
| 26 | **AVINASH KUMAR** | **17102117026** |
| 27 | **MUKESH KUMAR SINGH** | **17102117028** |
| 28 | **SAURABH KUMAR RAUSHAN** | **17102117029** |
| 29 | **MUNNA KUMAR GUPTA** | **17102117030** |
| 30 | **PAPPU KUMAR** | **17102117031** |
| 31 | **AVINASH CHAUDHARY** | **17102117032** |
| 32 | **SATISH KUMAR** | **17102117033** |
| 33 | **PAWAN KUMAR** | **17102117034** |
| 34 | **CHANDAN KUMAR** | **17102117035** |
| 35 | **MD RAHBER REYAZ** | **17102117036** |
| 36 | **VINAY RANJAN** | **17102117037** |
| 37 | **MANISH KUMAR** | **17102117038** |
| 38 | **RAJ KUMAR** | **17102117039** |
| 39 | **PAPPU PRASAD** | **17102117040** |
| 40 | **SANJEET KUMAR** | **17102117041** |
| 41 | **MD IRSHAD AHMAD** | **17102117042** |
| 42 | **VIMAL KUMAR** | **17102117043** |
| 43 | **MD SHAHADAT** | **17102117044** |
| 44 | **MD TARIQUE ANWAR** | **17102117045** |
| 45 | **PRASHANT KUMAR CHOUDHARY** | **17102117046** |
| 46 | **KARTIKESHWAR SAH** | **17102117047** |
| 47 | **YASIR** | **17102117048** |
| 48 | **ANSHUMAN KUMAR** | **17102117049** |
| 49 | **MANISH KUMAR** | **17102117050** |
| 50 | **SURAJ KUMAR** | **17102117051** |
| 51 | **PANKAJ KUMAR** | **17102117052** |
| 52 | **AQUIB ALAM** | **17102117053** |
| 53 | **AMRENDRA KUMAR SHARMA** | **17102117054** |
| 54 | **MD SAZID ANSARI** | **17102117055** |
| 55 | **ABHISHEK PATEL** | **17102117056** |
| 56 | **RAUSHAN KUMAR** | **17102117057** |
| 57 | **SUMIT KUMAR** | **17102117058** |
| 58 | **RAHUL PRASAD** | **17102117059** |
| 59 | **ADITYA SUMAN** | **17102117060** |
| 60 | **AMAN KUMAR** | **17102117061** |
| 61 | **ANUJ KUMAR** | **17102117062** |
| **62** | **Anurag Raj** | **18102117901** |
| **63** | **Manjeet kumar** | **18102117902** |
| **64** | **Akshay kr. Verma** | **18102117903** |
| **65** | **Rajesh Kumar** | **18102117904** |
| **66** | **Rashmi Kumari** | **18102117905** |
| **67** | **Krishna kumar** | **18102117906** |
| **68** | **Diwakar singh** | **18102117907** |
| **69** | **JITENDRA KUMAR** | **18102117908** |
| **70** | **Aditya prashant** | **18102117909** |

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| **Institute / College Name :** | LOK NAYAK JAI PRAKASH INSTITUTE OF TECHNOLOGY,CHAPRA | | |
| **Program Name** | **B.E. MECHANICAL** | | |
| **Course Code** | 021821 | | |
| **Course Name** | CAD/CAM | | |
| **Lecture/Tutorial/Lab (per week):** | 3/2 | **Course Credits** | 4 |
| **Course Coordinator Name** | SACHINDRA KUMAR | | |

1. **Scope and Objectives of the Course**

Computer-aided design (CAD) involves creating computer models defined by geometrical parameters. These models typically appear on a computer monitor as a three-dimensional representation of a part or a system of parts, which can be readily altered by changing relevant parameters. CAD systems enable designers to view objects under a wide variety of representations and to test these objects by simulating real-world conditions.

Computer-aided manufacturing (CAM) uses geometrical design data to control automated machinery. CAM systems are associated with computer numerical control (CNC) or direct numerical control (DNC) systems. These systems differ from older forms of numerical control (NC) in that geometrical data are encoded mechanically. Since both CAD and CAM use computer-based methods for encoding geometrical data, it is possible for the processes of design and manufacture to be highly integrated. Computer-aided design and manufacturing systems are commonly referred to as CAD/CAM.

Today, the use of CAD has permeated almost all industries. From aerospace, electronics to manufacturing, CAD is used in all industry verticals. Since CAD encourages creativity and speeds up productivity, it is becoming more and more useful as an important tool for visualization before actually implementing a manufacturing process. That is also one of the reasons CAD training is gaining more and more importance.

1. Textbooks:

1. Mastering CAD/CAM by Ibrahim Zeid

2. CAD/CAM by M Groover & E Zimmer

3. CAD/ACM : Principles & Applications by P N Rao

1. **Reference Books**

1.CAD/CAM/CIM by P. Radhakrishnan & S. Subramanyam

2.CAD/CAM/CIM by Vikram Sharma & Agrawal

1. **Course Plan**

|  |  |  |  |
| --- | --- | --- | --- |
| **Lecture Number** | **Topics** | **Web Links for video lectures** | **Text Book / Reference Book / Other reading material** |
| 1-4 | **Introduction concept of CAD/CAM** |  | CAD/CAM by M Groover & E Zimmer |
|  |  |  |  |
| 4-6 | **Computer system, Hardware in computer Aided Design System, Product cycle Automation part programing** |  | Mastering CAD/CAM by Ibrahim Zeid |
|  |  |  |  |
| 6-8 | **Computer Aided Design system software,Transformation, Geometric Modeling, Drafting applications** |  | CAD/CAM/CIM by Vikram Sharma & Agrawal |
|  |  |  |  |
| 4-6 | **CAD/CAM Technology to finite element data preparation, concept of data structures** |  | CAD/ACM : Principles & Applications by P N Rao |
|  | . |  |  |
| 8-9 | **NC, CNC, DNC Programing** |  | CAD/CAM/CIM by P. Radhakrishnan & S. Subramanyam |
|  |  |  |  |
| 8-9 | **Introduction to AVG** |  | CAD/ACM : Principles & Applications by P N Rao |
|  |  |  |  |

**Evaluation Scheme:**

|  |  |  |
| --- | --- | --- |
| Component 1 | Mid Semester Exam | 20 |
| Component 2 | Assignment Evaluation | 10 |
| Component 3\*\* | End Term Examination\*\* | 70 |
|  | **Total** | **100** |

**\*\*** The End Term Comprehensive examination will be held at the end of semester. The mandatory requirement of 75% attendance in all theory classes is to be met for being eligible to appear in this component.

**This Document is approved by:**

|  |  |  |
| --- | --- | --- |
| **Designation** | **Name** | **Signature** |
| Course Coordinator | Sachindra Kumar |  |
| H.O.D | Kumar Jyotiraditya |  |
| Principal | Dr. Anil Kumar Singh |  |
| Date |  |  |

**Evaluation and Examination Blue Print:**

Internal assessment is done through quiz tests, presentations, assignments and project work. Two sets of question papers are asked from each faculty and out of these two, without the knowledge of faculty, one question paper is chosen for the concerned examination. Examination rules and regulations are uploaded on the student’s portal. Evaluation is a very transparent process and the answer sheets of sessional tests, internal assessment assignments are returned back to the students.

The components of evaluations alongwith their weightage followed by the University is given below

Sessional Test 1 20%

Assignments/Quiz Tests/Seminars 10%

End term examination 70%

(From amongst the three sessional tests best of two are considered)

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| --- | --- | --- | --- |
| **Institute / College Name :** | LOK NAYAK JAIPRAKASH INSTITUTE OF TECHNOLOGY CHAPRA, BIHAR | | |
| **Program Name** | **B TECH MECHANICAL ENGINEERING** | | |
| **Course Code** | **021821** | | |
| **Course Name** | CAD/CAM | | |
| **Lecture / Tutorial (per week):** | 3/2 | **Course Credits** | 4 |
| **Course Coordinator Name** | Sachindra Kumar | | |

**Lecture plan**

|  |  |  |
| --- | --- | --- |
| **Topics** | **Lecture number** | **Book And page no.** |
| **Unit:1** |  |  |
| Introduction | 2 | T2-(1-5) |
| Concepts of CAD/CAM | 2 | T2-(6-10) |
| **Unit:2** |  |  |
| Computer System | 1 | T2-(11-12) |
| Hardware in computer-Aided Design System | 2 | T2-(12-25) |
| Product Cycle Automation | 2 | T2-(3,384) |
| Part programing | 2 | T2-(425-458) |
| **Unit:3** |  |  |
| Computer Aided Design System software | 2 | T2-(87-104) |
| Transformation | 2 | T2-(107-132) |
| Geometric Modeling | 2 | T1-(180-183) |
| Drafting Applications | 2 | T1-(184-187) |
| **Unit:4** |  |  |
| CAD/CAM technology to finite element data preparation | 3 | T2-(229-270) |
| Concept of data structures | 3 | T1-(310-316) |
| **Unit:5** |  |  |
| NC | 3 | T2-(425-458) |
| CNC | 3 | T2-(395-411) |
| DNC Programming | 3 | T2-(411-417) |
| **Unit:6** |  |  |
| Introduction to AVG | 9 | T3-(359-363) |
| Total | 43 |  |

* **Text book-1 (T-1)-CAD/CAM: Principles and Applications by P.N.Rao,TMH Publication**
* **Text book-2 (T-2) Fundamental of CAD/CAM by Vikram Sharma, S.K.Katariya & Sons Publication**
* **Text book -3 (T-3) CAD/CAM:Computer Aided Design and Manufacturing by M.Groover & E.Zimmers**

**Lok Nayak Jai Prakash Institute Of Technology,Chapra**

**CAD/CAM**

**Assignment-I**

1. Write any five advantages and disadvantages by the adoption of CAD.

2. Write any 10 AutoCAD commands with small description.

3. Differentiate between Algebraic and Geometric form of a curve.

4. Write Bezier surface and B-Spline surface mathematical relations.

5. What are M03, M30 codes stands for in NC Programming?

6. Explain the use of MACROs in part programming?

7. List the methods available for taking decisions in a process plan.

8. What do you understand by the terms PDIR, MRIR and PPIR?

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**CAD/CAM**

**Assignment-II**

1. What is Automation? What are its types?

2. State the application of Computer Aided Design.

3. Explain Geometric modeling and Finite element analysis in CAD.

4. What are the functions of input and output devices? Explain various types of output devices in CAD/CAM .

5. Define NC system. Explain working of basic components of NC machine.

6. Write short notes on the following

(a) Fixed zero and Floating zero

(b) Continuous path system

(c) Automated Guided Vehicle

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MID SEMESTER EXAMINATION, 2017-18

**CAD/CAM**

TIME:2 HRS FULL MARKS: 20

Attempt any four questions

1.Define CAD and explain the role of various software tools in CAD.

2.State the application of Computer for design.

3.State the benefits of Computer Aided Design in Mechanical Engineering.

4. What are the functions of input and output devices?

5.Differentiate between wireframe and solid modeling technique.

6.With the help of an example, explain the following 2D and 3D transformations:

(a) Translation

(b) Scaling

(c) Rotation

Lok Nayak Jai Prakash Institute of Technology



B.Tech 7th semester Mid Semester examination- 2018-2019

Subject name –CAD/CAM

Time: 2 hours Full Marks: 20

Attempt any four question

1. Discuss the hardware components of a typical interactive graphic system.(CAD/CAM)
2. Give an example with the help of a neat sketch of CAD where a lathe tool is called up to show a machine sequence.
3. What are the basic difference between the abstract data type Stack and Queue?
4. Describe the application of computers in design process of any machine element.
5. Describe the general form of SQL Query. How does client interact with data base server?

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MID SEMESTER EXAMINATION, 2016-2017

**CAD/CAM**

TIME:2 hrs FULL MARKS: 20

Attempt any two questions

1. a) Briefly explain the conventional process of the product cycle in conventional manufacturing environment.

b) Draw the block diagram of the data exchange method between two different CAD systems using neutral data format.

2. a) How do you distinguish between a CPU and a Microprocessor.

b) What are the Input devices and Output devices, explain them briefly.

3. a) Give a classification of the different surfaces that can be used in Geometric modelling applications.

b) What is meant by sweep? Discuss in detail the various types of sweep techniques available for 3D geometric construction.

4. a) Explain linier and circular interpolations in CNC systems.

b) What is manual CNC part programming? Explain with an example