Course: **TA201T Introduction to Manufacturing Processes**

Credits: 03

Instructor In-Charge: Dr. Anish Upadhyaya

Professor

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Course Tutors:

**Tutors:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
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| 4 | HARISH RANOT | 19106273 | [hrano@iitk.ac.in](mailto:hrano@iitk.ac.in) | 7807158924 | **S-4** |
| 5 | SOURAV GHOSH | 17206265 | [gsourav@iitk.ac.in](mailto:gsourav@iitk.ac.in) | 9679700696 | **S-5** |
|  | all tutors are PhD students in MSE Department |  |  |  |  |

Course Teaching Assistants:

**Teaching Assistants:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Student Name** | **Roll No** | **Email Id** | **Contact No** | **Section assigned** | **Tutor Assigned** |
| 1 | Deepanshu Verma | 19106012 | [verma@iitk.ac.in](mailto:verma@iitk.ac.in) | 7814350692 | **S-1** | MIRTUNJAY KUMAR |
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| 10 | Pooja Kumari | 19106020 | poojak@iitk.ac.in | 7736485277 | **S-5** | SOURAV GHOSH |
| 11 | Swapnil Ankush Sawalkar | 19106036 | [swapnil@iitk.ac.in](mailto:swapnil@iitk.ac.in) | 9890292730 | Dr. Anish Upadhyaya | |

**General Information**

**Grading Policy:**

* **Mid-Sem Examination (online): 15%**
* **End-Sem Examination:** **25%**
* **Continuous Assessment-I:**  **20%**

*Announced Quiz 5%*

*Unannounced Quiz 5%*

*Interaction with Tutors and Section TAs 5%*

*Participation in the Discussion Hour 5%*

* **Continuous Assessment-II:**  **20%**

*Assignment: 20%*

* **Presentation-Based Assignment: 20%**

*Presentation I: About a Manufacturing Case Study 10%*

*Presentation II: About a Manufacturing Process 10%*

The course will be conducted in *Flipped Classroom* mode. The lecture slides (Powerpoint file with embedded audio) will be shared with you about a week before the scheduled discussion hour. In the *discussion* hour, queries and queries related to the same will be discussed. There will be a total of 13 Discussion Sessions starting from 1 Sep to 30 Nov 2019 [through Zoom]

All registered students are requested to remain in regular contact with your respective section tutor and teaching assistants regarding queries related to grading of quiz and assignments.

**GUIDELINES/REQUESTS:**

* For the discussion hour, please join on schedule. In case of any issues in accessing zoom do inform your respective tutor through email messaging or in case of urgency Whatsapp/Phone call.
* In view of the limited time available for discussion, it will be of immense help if you can forward your queries to me through email about 48 hours before the lecture. This way, related queries can be grouped and addressed accordingly.
* Please follow the protocol of keeping your mic off when not speaking. In view of anticipated bandwidth issues, it is recommended to keep your video off unless it is really required.
* All assignments should be submitted within the schedule.
* Instructors, Tutors and TAs would prefer being contacted preferably through email. Phone calls should be restricted only in case any exigency.

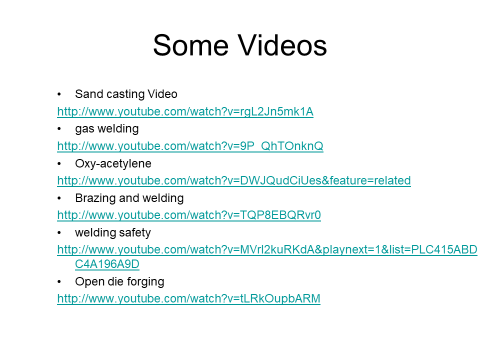
Lecture Plan

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| **Lecture 1** | Course introduction; Material classification; Role of Materials and Some illustrative case studies |
| **Lecture 2** | Concept of microstructure; Effect of processing variables on microstructure; Microstructure-property-processing interrelationship |
| **Lecture 3** | Solidification Processing: Fundamentals; Moulding and Casting; Expendable and non-expendable patterns and moulds; Sand casting; Design of runner and riser; Effect of solidification on gas solubility and microstructure development (chill zone, columnar and equiaxed grains) |
| **Lecture 4** | Solidification Processing: Effect of pressure on solidification processing (pressure die-casting, vacuum casting); Investment, Lost-wax casting; Injection Molding of Polymers; Shaping of ceramics using slip- and tape-casting; Select case studies |
| **Lecture 5** | Joining Processes: Soldering; Brazing and Welding  Solid-state and fusion welding; Heat-affected zone (HAZ) |
| **Lecture 6** | Joining Processes (contd): Forge welding, Friction welding, Electron-beam and Laser-beam welding, Submerged-arc welding; Select case studies |
| **Lecture 7** | Powder Metallurgical Processing: Process fundamentals; metal and ceramic powder production and compaction techniques (single- versus double-action pressing), Sintering |
| **Lecture 8** | Select case studies in PM processing: Porous bronze bearing; Heavy alloys for ordnance and Ferrous alloys for automotive applications. |
| **Lecture 9** | Deformation Processing: Effect of temperature, stress state and strain rate on deformation; Bulk deformation processes |
| **Lecture 10** | Rolling, Forging, Swaging and Wire-drawing |
| **Lecture 11** | Sheet Deformation Processing: Deep drawing; Select case studies |
| **Lecture 12** | Heat-Treatment of Ferrous and Non-Ferrous Alloys |
| **Lecture 13** | Surface Modification Techniques |
| **Lecture 14** | Recent advances in manufacturing (rapid solidification processing, superplastic forming, rapid prototyping and rapid tooling) |

**RECOMMENDED READING:**

Fundamentals of Modern Manufacturing: Mikell P. Groover

Fundamental of Manufacturing: G.K. Lal and S.K. Choudhury

Links of many other videos will be shared during the semester