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OFFICE OF THE REGISTRAR
NOTICE

DIT UNIVERSITY
IMAGINE ASPIRE ACHIEVE

Ref: Regi:- 126752 - CDC/VAT/2-2-21/TB

Date: 15th January 2021.

Subject: Schedule for ONLINE Technical Training – EDM

Attention: Students of B.Tech 6th Semester (ME & ME-AE)

The students are hereby informed that the Technical Training – EDM will be starting from **10th January 2021** and It will be semester long training for the students of **B.Tech 6th Semester (ME & ME-AE).**

1. It is mandatory for above mentioned students to attend the training.
2. The training will run in online mode (till further notice) on MS Team. Students will be assigned batch (as per the schedule) and will be added to their respective MS Teams.
3. It is suggested to all the above-mentioned students to attend the training (detailed schedule will be shared in your respective batch on MS Team).
4. The Department concerned shall notify the details about timings and MS Team batch of the training sessions. In case of any query please contact the Career Development Centre, DIT University.

Dr. Vandana Suhag

Registrar

Registrar
DIT University, Dehra

To:

- All Deans / Directors
- HoDs
- CDC

With the request to bring the above to the notice of the students

Copy for information to:

- Hon'ble Chairman
- Hon'ble Chancellor
- Hon'ble Vice Chancellor
- Hon'ble Pro Vice Chancellor
- ICT Manager – to upload on website

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VAT- 82: ONLINE Technical Training-EDM

Course: -B.Tech- ME & ME-AE-3rd Year **Venue**: -Chanakya Seminar Hall

Organized By- Department of Mechanical Engineering **Date:** -10th January -23rd April 2021

Duration: -45 Hours **Timings:** -2:00 PM to 4:00 PM (Every Monday)

Organized By: Career Development Centre, DIT University

Conducted By: Dr. Nalin Somani (Department of Mechanical Engineering, DIT University)

Electrical discharge machining (EDM) is a popular nonconventional machining approach that is often used on hard materials. This method is popular because of the fact that EDM can machine any materials irrespective of its hardness. Modern engineering materials that are deployed in extreme conditions are often shaped or manufactured by EDM process. Other conventional or nonconventional manufacturing methods can be combined with EDM to create a more uniform and balanced machining setup. Hybrid or combined approaches of machining can overcome the inherent drawbacks of EDM process. The performance of machining can improve significantly when other manufacturing processes are incorporated with conventional EDM.

Training Objective:

- The primary objective of this Training class is to teach participants Finite Element Analysis.
- Thus, upon completion of this course, participants will be able to set up, solve, and diagnose their own Structural Analyses.
- This is a problem-based training where the focus will be on understanding what's under the black box so as to move beyond garbage-in, garbage-out.
- Learners practice using a common solution approach to problems involving different physics: structural mechanics, fluid dynamics and heat transfer.
- Textbook examples are solved to help understand the fundamental principles of finite-element analysis.
- Then these principles are applied to simulate real-world examples in the tool including a bolted rocket assembly and a wind turbine rotor.
- By working through examples in a leading simulation tool that professionals use, students learn to move beyond button pushing and start thinking like an expert.

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COURSE FILE

NAME OF COURSE: VAT-EDM

COURSE CODE: ME332

BRANCH: ME

SESSION: 2021-22

NAME OF FACULTY: Dr. Nalin Somani

NAME OF COURSE COORDINATOR: Dr. Nalin Somani

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Course Details

Subject Code: ME332

Marks: 100

Number of Lecture hours per week: 0

Credits: 0

L-T-P: 0-0-2

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PEO, PO and PSO

Program Educational Objectives (PEOs)

PEO1: To provide foundation in the mathematical, scientific and engineering fundamentals necessary for professional developments of students in mechanical engineering.

PEO2: To provide ability to analyze, interpret apply engineering proficiency for the solutions of real life mechanical engineering problem.

PEO3: To develop skills to analyze and design the mechanical system used in industries for better employability.

PEO4: To develop the leadership and innovation qualities among students for lifelong learning.

PEO5: To instill the professional attitude towards team work and multidisciplinary approach to solve the social problems.

Program Outcomes (PO): - {For B. Tech Program}

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 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.

PO 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.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

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TIME TABLE ODD SEM 2021-22:

Name of the Faculty: Dr. Nalin Somani **Designation of the Faculty: Assistant Professor**

Periods Days	1st 9:00-	2nd 10:00-	3rd 11:00-	4th 12:00-	12:55 –	5th 14:00-	6th 15:00-	7th 16:00-
MONDAY						ME 332 (P)		
TUESDAY								
WEDNESDAY								
THURSDAY								
FRIDAY								
SATURDAY								

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LESSON PLAN	
Course: EDM	**Faculty Name:** Dr. Nalin Somani

EDM LESSON PLAN

SESSION 1	• Introduction to manufacturing process • Types of manufacturing process • Limitations of conventional machining process • need of non-conventional machining processes • Classification of non-conventional machining processes
SESSION 2	• Introduction of Electric Discharge Machining (EDM) • Principle of EDM machine • Advantages and limitations of EDM machine • Applications of EDM machine
SESSION 3	• Demonstration of EDM machine and its various components • Electrode and work-piece material and their properties.
SESSION 4	• Calculation of Material Removal Rate (MRR) & Tool Wear Rate (TWR)

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NOTES & RESULTS

INTRODUCTION

The main purpose of manufacturing processes is to transform materials into useful products. In the course of these operations, energy resources are consumed and the usefulness of material resources is altered. Each of these effects can have significant consequences for the environment and for sustainability, particularly when the processes are practiced on a very large scale. Accompanying the development of mechanical/manufacturing industry, the demands for alloy materials having the properties of high impact resistance, toughness and hardness are increasing. Such materials are difficult to be machined by traditional machining process. Therefore, non-traditional machining processes including ultrasonic machining, electrochemical machining, electro discharge machine (EDM) etc. are applied to machine such difficult to machining of materials. WEDM method with a thin cutting wire as an electrode transforms electrical energy to thermal energy for cutting such materials. With these methods, alloys, conductive ceramics and aerospace materials can be machined irrespective to their toughness and hardness. Thereafter, wire electro discharge machining is capable of producing a precise and fine, wear resistant and corrosion resistance surface.

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Chapter-3
RESULT AND DISCUSSION

Chapter four is generally discuss the results obtained throughout the experimental research analysis on the material removal rate (MRR) and Tool wear rate (TWR) after a period of machining process.

➢ DATA COLLECTION

Table 3.1: Data collection

EXP	ELECTRODE	MASS ELECTRODE BEFORE (g)	MASS ELECTRODE AFTER (g)	MASS W/P BEFORE (g)	MASS W/P AFTER (g)	TIME
1	Cooper	11.1402	11.1266	11.1402	142.7020	25m 17s
2	Cooper	11.2121	11.2082	143.4450	143.1936	25m 20s
3	Cooper	11.1260	11.1237	143.2495	143.0096	25m 46s
4	Cooper	11.1217	11.1143	142.8812	142.6335	25m 33s
5	Cooper	11.1237	11.1220	142.2405	141.9867	25m 3s
6	aluminum	10.5560	10.3952	143.0000	142.9462	18m 58s
7	aluminum	3.1011	3.0742	142.9121	142.8352	18m 33s
8	aluminum	10.3952	10.2345	142.0301	141.9398	18m 51s
9	aluminum	3.0145	2.9847	142.2999	142.221	18m 49s
10	aluminum	10.2345	10.0761	143.0359	142.9481	18m 45s
11	Brass	3.1350	3.1033	142.5420	142.4239	2h 58s
12	Brass	10.4444	10.2757	142.9789	142.4239	2h 1s
13	Brass	3.1033	3.0754	143.0378	142.9099	1h 52m 43s
14	Brass	10.8689	10.7212	143.0000	142.6781	2h 2m 4s
15	Brass	3.0754	3.0500	142.1770	142.0460	1h 51m 17s
			Total time			13h 24m 3s

❖ ANALYSIS OF MATERIAL REMOVAL RATE (MRR)

MRR is the rate at which material is removed from the workpiece. Electric sparks are produced between the tool and workpiece during the machining process. Each spark produces a tiny crater and thus erosion of material is caused.

The MRR is defined as the ratio of the difference in weight of the workpiece before and after machining to the density of the material and the machining time

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Before (g)	143.0000	142.9121	142.0301	142.7999	143.0359
After (g)	142.9462	142.8357	141.9393	142.221	142.9481
Different Mass (g)	0.0538	0.0764	0.0908	0.0778	0.0878
Time	18m 58s	18m 33s	18m 31s	18m 49s	18m 45s

➢ Calculation of Material Removal Rate (MRR)

MRR (gms/min) = (w_{jb} - w_{ja}) / t

MRR (mm^3/min) = (w_{jb} - w_{ja})*1000 / (density*time)

MRR (mm^3/min) =(536.630-531.570)*1000/(8.05*20)=31.73 mm^3/min

Where
w_{jb}- weight of the workpiece before machining
w_{ja}- weight of the workpiece after machining

Table 3.5: Observation

S.NO.	Voltage (V) V	Current (I) A	Pulse Time (t_{on}) ()	Initial Wt. (w_{jb}) gms	Final Wt. (w_{ja}) gms	Weight Loss (w_{jb} - w_{ja})	Machining Time (t) mins
1	60	20	12	563.630	531.570	5.06	20
2	60	20	12	80.91			20

❖ ANALYSIS OF TOOL WEAR RATE (TWR):

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Chapter-4

❖ CONCLUSION

For high discharge current, copper electrodes show highest MRR, whereas Brass gives good surface finish and normal MRR. Since EDM is a thermal method, special attention must be paid to surface integrity. Surface and subsurface damage may be induced owing to thermal fatigue or to the material recast on the surface after removal. The MRR could be improved by carrying out research on electrode design, process parameters, EDM variations, powder mixed dielectric and electrically insulated electrodes. It is found that the basis of controlling and improving MRR mostly relies on empirical methods. This is largely due to stochastic nature of the sparking phenomenon involving both electrical and non-electrical process parameters along with their complicated interrelationship.

◆ Applications

➢ Prototype production

The EDM process is most widely used by the mold-making, tool, and die industries, but is becoming a common method of making prototype and production parts, especially in the aerospace, automobile and electronics industries in which production quantities are relatively low. In sinker EDM, a graphite, copper tungsten, or pure copper electrode is machined into the desired (negative) shape and fed into the workpiece on the end of a vertical ram.

➢ Coinage dies making

FIG.4.1

Master at top, badge die work piece at bottom, oil jets at left (oil has been drained). Initial flat stamping will be "dapped" to give a curved surface.

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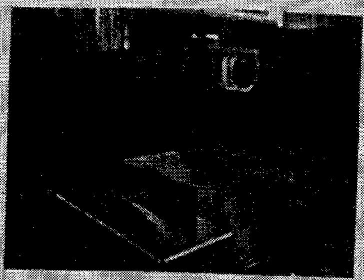

FIG.4.4

Small whole drilling EDM machines.

Small hole drilling EDM is used in a variety of applications.

On wire-cut EDM machines, small hole drilling EDM is used to make a through hole in a workpiece in through which to thread the wire for the wire-cut EDM operation. A separate EDM head specifically for small hole drilling is mounted on a wire-cut machine and allows large hardened plates to have finished parts eroded from them as needed and without pre-drilling.

Small hole EDM is used to drill rows of holes into the leading and trailing edges of turbine blades used in jet engines. Gas flow through these small holes allows the engines to use higher temperatures than otherwise possible. The high-temperature, very hard, single crystal alloys employed in these blades makes conventional machining of these holes with high aspect ratio extremely difficult, if not impossible.

Small hole EDM is also used to create microscopic orifices for fuel system components, spinnerets for synthetic fibers such as rayon, and other applications.

There are also stand-alone small hole drilling EDM machines with an x–y axis also known as a super drill or hole popper that can machine blind or through holes. EDM drills bore holes with a long brass or copper tube electrode that rotates in a chuck with a constant flow of distilled or deionized water flowing through the electrode as a flushing agent and dielectric. The electrode tubes operate like the wire in wire-cut EDM machines, having a spark gap and wear rate. Some small-hole drilling EDMs are able to drill through 100 mm of soft or through hardened steel in less than 10 seconds, averaging 50% to 80% wear rate. Holes of 0.3 mm to 6.1 mm can be achieved in this drilling operation. Brass electrodes are easier to machine but are not recommended for wire-cut operations due to eroded brass particles causing "brass on brass" wire breakage, therefore copper is recommended.

- Metal disintegration machining

Several manufacturers produce MDM machines for the specific purpose of removing broken tools (drill bits, taps, bolts and studs) from work pieces. In this application, the process is termed "metal disintegration machining" or MDM. The metal disintegration process removes only the center of the tap, bolt or stud leaving the hole intact and allowing a part to be reclaimed.

- Closed loop manufacturing

  Closed loop manufacturing can improve the accuracy and reduce the tool cost.

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Assessments details:

VAT EXAMINATION (EDM LAB)

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Session 2021-2022

Course: B.Tech Year: III Department: Mechanical Engg. Roll No. ....

SAP ID........................

Q 1-25.....3 MARKS

Total Marks..100

Q1. In conventional machining techniques which type of energy has role in material removal from the workpiece?

a. Thermal Energy. b. Mechanical Energy c. Kinetic Energy d. Electrical Energy

Q2. What is the range if spark gap in EDM technique?

a. 0.5-5 mm. b. 0.05-0.5 mm c. 0.005-0.05mm. d. 0.0005-0.005mm

Q3. In EDM, temperature developed during machining is of the order of

a. 2000°C. b. 10000° C. c. 4000° C d. 20,000°C

Q4. Which of the following material will not be able to machine in EDM?

a. Hardened Steel b. Glass Fiber Epoxy Reinforced Composite c. Tungsten Carbide d. Carbon Fiber Epoxy Reinforced Composites

Q5. Which of the following is the non conventional machining technique?

a. Lancing b. Tapping c. Ultrasonic Machining d. None of the above

Q6. Which of the following set of variables are used as process parameters in EDM?

a. Voltage, Hardness, Pulse on Time
b. Pulse off Tome, Pulse on Time. Voltage
c. Hardness, Surface Finish, Material Removal Rate
d. Current , Resistance, Hardness

Q7. Rolling is________type of manufacturing.

a. Negative b. Positive c. Additive d. Zero

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Q8. In conventional machining techniques, ______ tool and ______workpiece are used.

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Q18. Limitation of EDM technique is

a. High tool wear rate b. Low cutting force c. Low material removal rate d. None of the above

Q19. Which of the following materials is/are used for EDM technique?

a. Brass b. Copper c. Graphite d. All of the above

Q20. In EDM process the metal removal is carried out by

a. Fracture in the work material b. Electrolysis c. Melting & vaporization d. None of the above

Q21. In which type of industries, EDM process can be used for making products?

a. Aerospace b. Automobile c. Medical d. All of the above

Q22. Example of Dielectric Fluid is

a. Kerosene b. EDM Oil c. Both (a) and (b) d. None of the above

Q23. Performance parameters in EDM is/are

a. Gap Voltage
b. Surface Finish
c. Peak Current
d. All of the above

Q24. In EDM, Reverse Polarity stands for

a. Tool-Negative charge and Workpiece- Positive charge
b. Tool-Positive charge and Workpiece- Negative charge
c. Tool- Neutral and Workpiece- Negative charge
d. None of the above

Q25. In rough machining using EDM technique, ___ Current and ___ Gap Voltage are used.

a. Low , Low b. High, Low c. High, High d. Low, High

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Annexure - II				
Value added course Details (Academic Year: 2020-21)				
VAT Course Name: Electrical Discharge Machining Training				
VAT Code: VAT 82				
Duration in Hours: 45				
Number of Students Enrolled: 85				
Number of Students Completed: 81				
Grades:	**G= GOOD ; S = Satifactory ; P = Poor ; W = Withdraw**			
Student ID	**Student Name**	**Program/Course**	**Year**	**Passing Grade**
190106911	HIMANSHU SEMWAL	BTME	3rd Year	G
190106918	MOHD AADIL	BTME	3rd Year	G
180106055	SURYA PRAKASH	BTME	3rd Year	S
190106912	NIPUN BHARDWAJ	BTME	3rd Year	S
180101011	MUKESH NEGI	BTME	3rd Year	S
180106016	KARAN TIWARI	BTME	3rd Year	S
190106915	BIPUL KUMAR	BTME	3rd Year	G
190106917	NAVEEN NEGI	BTME	3rd Year	P
190106910	DEVENDRA SINGH KARKI	BTME	3rd Year	S
180106031	MILIND SAXENA	BTME	3rd Year	S
180113028	APURV RAJ	BTME-AE	3rd Year	G
180113021	KULDEEP SINGH	BTME-AE	3rd Year	G
180113023	SURAJ KUMAR	BTME-AE	3rd Year	S
180106013	SHUBHAM PANCHAL	BTME	3rd Year	S
180106043	CHIRAG SHRIVASTAVA	BTME	3rd Year	G
180106008	AMAN MAMGAIN	BTME	3rd Year	P
180106003	AHMAD ATHAR	BTME	3rd Year	S
190106916	DEEPAK YADAV	BTME	3rd Year	G
180106017	SHREY KUKRETI	BTME	3rd Year	G
180113010	NAMAN RAWAT	BTME-AE	3rd Year	S
180113025	RAKSHIT SINGH	BTME-AE	3rd Year	S
180106027	ATISHEY SINGH	BTME	3rd Year	S
190113902	SUNIL PANWAR	BTME-AE	3rd Year	G
180113019	MRINAL THAKURI	BTME-AE	3rd Year	G
180106049	ANUJ GUPTA	BTME	3rd Year	S
190106913	SHIVAM JOSHI	BTME	3rd Year	S
180113001	SHREYASH KUMAR SINGH	BTME-AE	3rd Year	G
180106051	PURNENDU KUMAR SINGH	BTME	3rd Year	G
180106005	GAURAV GUPTA	BTME	3rd Year	S
180106032	SUNDARAM BARTHWAL	BTME	3rd Year	S
180113014	SATYAM BARTHWAL	BTME-AE	3rd Year	G
180106036	RAJAT JOSHI	BTME	3rd Year	S
180101020	SURUCHI CHAUHAN	BTME	3rd Year	S
180106047	ASHISH BISHT	BTME	3rd Year	G
180113013	VAIBHAV SINGH RAWAT	BTME-AE	3rd Year	G
180106018	NITIN SEMWAL	BTME	3rd Year	S
180106010	RITURAJ SHARMA	BTME	3rd Year	S
180106034	AYUSH SRIVASTAVA	BTME	3rd Year	G
180106029	SARTHAK SAINI	BTME	3rd Year	G

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Head - CDC
Career Development Cell
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180106038	ANSHUL JOSHI	BTME	3rd Year	S
180113026	BHAWESH KHATRI	BTME-AE	3rd Year	S
180113002	MILJOT SINGH GAMBHIR	BTME-AE	3rd Year	G
180113031	SANCHIT AGARWAL	BTME-AE	3rd Year	G
180113011	VINAYAK AGRAWAL	BTME-AE	3rd Year	P
180106002	APURAV GUPTA	BTME	3rd Year	S
190106900	ANUPAM KIMOTHI	BTME	3rd Year	G
180106001	PRASOON TRIPATHI	BTME	3rd Year	S
180106037	BHARAT THAKUR	BTME	3rd Year	S
180113029	YASH CHAUDHARY	BTME-AE	3rd Year	G
180113008	ABHINAV PAL	BTME-AE	3rd Year	G
180106046	AYUSH SHRIVASTAV	BTME	3rd Year	S
180113017	PIYUSH MITTAL	BTME-AE	3rd Year	S
180113003	DASHMESH SINGH SURI	BTME-AE	3rd Year	G
180106044	ANKIT KUMAR SINGH	BTME	3rd Year	P
180106015	UJJAWAL BHANDAARI	BTME	3rd Year	S
180106030	KARTIK BHATT	BTME	3rd Year	S
180106022	SUNIDHI SHARMA	BTME	3rd Year	G
180106011	ABHISHEK RAWAT	BTME	3rd Year	G
180113024	PIYUSH GUPTA	BTME-AE	3rd Year	S
180113004	NIKHIL NEGI	BTME-AE	3rd Year	S
180106050	RAHUL RAJ	BTME	3rd Year	G
180106023	MOHD RAGHIB	BTME	3rd Year	S
180113007	SYED BILAL AHMAD	BTME-AE	3rd Year	S
180106035	SUMEDHA BAIDYA	BTME	3rd Year	G
180113020	ROHIT NEGI	BTME-AE	3rd Year	G
180106057	AJAY BHAN	BTME	3rd Year	S
180106009	ADITYA RAWAT	BTME	3rd Year	S
180113030	KANWAL SINGH	BTME-AE	3rd Year	G
180106053	PIYUSH GAUR	BTME	3rd Year	G
180106004	SURYANSH GOYAL	BTME	3rd Year	S
180106028	PRABHAT KUMAR JHA	BTME	3rd Year	S
180106019	PRASHANT JOSHI	BTME	3rd Year	G
180106041	SAHIL RAJ	BTME	3rd Year	G
180106012	PRAJJWAL CHHIMWAL	BTME	3rd Year	S
190113900	RISHAV SINGH	BTME	3rd Year	S
180113018	AMIT RAWAT	BTME-AE	3rd Year	G
180106054	AYUSH NEGI	BTME	3rd Year	S
180113022	ROHAN VYAS	BTME-AE	3rd Year	S
180113012	ANKIT NEGI	BTME-AE	3rd Year	G
180106014	SAGAR SUNIL BHATT	BTME	3rd Year	G
180113009	ANIL SINGH KUNWAR	BTME-AE	3rd Year	S
180106024	RITIK OJHA	BTME	3rd Year	S
180106021	ANKIT SINGH PANWAR	BTME	3rd Year	G
180106052	HIMANI SINGH	BTME	3rd Year	G
180113006	OJAS RATURI	BTME-AE	3rd Year	S

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