## DEPARTMENT OF __METALLURGICAL AND MATERIALS ENGINNERING__

## NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

| COURSE PLAN – PART I | | | |
|---|---|---|---|
| **Name of the programme and specialization** | **M Tech. (Materials Science and Engineering)** | | |
| **Course Title** | **Electrical, Magnetic and Optical Materials** | | |
| **Course Code** | **MT 651** | **No. of Credits** | **3** |
| **Course Code of Pre-requisite subject(s)** | **Nil** | | |
| **Session** | **July 2019** | **Section (if, applicable)** | **NA** |
| **Name of Faculty** | **Dr. N. Ramesh Babu** | **Department** | **MME** |
| **Email** | **rameshrohith@gmail.com**<br>**nrb@nitt.edu** | **Telephone No.** | **2503464**<br>**9444932221** |
| **Name of Course Coordinator(s) (if, applicable)** | **NA** | | |
| **E-mail** | | **Telephone No.** | |
| **Course Type** | ☐ **Core course--YES** | | |

**Syllabus (approved in BoS)**

Electrical and Dielectric Materials: Review of electrical conduction - resistivity and dielectric phenomena - concept of polarization - effects of composition, frequency and temperature on these properties - discussion on specific materials used as conductors (OFHC Copper, Al alloys, Fe-Si alloys, amorphous metals) - discussion on specific materials used as dielectrics (ceramics and polymers) - dielectric loss, dielectric breakdown - ferro electricitypiezo and pyro electricity.

Magnetic Materials: Introduction to dia, para, ferri and ferro magnetism - hard and soft magnetic materials - iron- silicon alloys – iron, nickel alloys - ferrites and garnets - (Ag - Mn - Al) alloys - (Cu - Ni-Co) alloy - fine particle magnets - applications of hard and soft magnetic materials - Giant magneto resistance- Nanomaterials.

Semiconducting and Superconducting Materials: Review of semiconducting materials - concept of doping - simple and compound semiconductors - amorphous silicon, oxide semiconductors; amorphous semiconductors - FER, MOSFET and CMOS - Concept of super condcutivity

Production of Electronic Materials: Review of electronic materials - methods of crystal growth for bulk single crystals - zone melting-refining, leveling - synthesis of epitaxial films by VPE, PVD, MBE and MOCVD techniques - lithography; production of silicon - starting applications.

Optical Properties of Materials:Introduction toelectromagnetic radiation, atomic and electronic

interactions with electromagnetic radiation, optical propert ies of metals, optical propert ies of nonmetals, opacity and translucency in insulators, color of materials, applications of optical phenomena-luminescence,photoconductivity, lasers, optical fibers in communications

**COURSE OBJECTIVES**

The objective of this course is to provide students a fundamental understanding of electrical, magnetic and optical properties of materials and to apply those fundamentals for selecting and developing materials for different engineering applications.

**COURSE OUTCOMES (CO)**

| **Course Outcomes** | **Aligned Programme Outcomes (PO)** |
|---|---|
| After the completion of this course, the student will be able to:<br><br>1.Understand the conducting, semiconducting, superconducting, dielectric, ferro-eleletric and piezoelectric behavior of materials<br><br>2. Differentiate between diamagnetic, paramagnetic, ferromagnetic, ferromagnetic, and anti-ferromagnetic behavior of materials<br><br>3. Synthesis and processing of semi-conducting materials for engineering applications<br><br>4. Study the effect of composition, structure and temperature on the properties of the materials .<br><br>5. Describe the interactions of light with materials and its effects at the interface<br><br>6. Understand the working principles of solid state devices, etc. | 1. Materials Science and Engineering post graduates are attaining knowledge of materials and their science & Engineering<br>2. Materials Science and Engineering post graduates are talented to formulate and analyse the engineering data.<br>3. Materials Science and Engineering post graduates can recognize classify and solve engineering problems.<br>4. Materials Science and Engineering post graduates are capable of exploring the resources to collect the required data, analyse and solve critical problems.<br>5. Materials Science and Engineering postgraduates have skills in locating and applying modern tools to resolve the complex engineering problems<br>**6.** Materials Science and Engineering post graduates are competent to work in research, industrial sectors and with multi-faceted team |

**COURSE PLAN – PART II**

**COURSE TEACHING AND LEARNING ACTIVITIES**

| **S.No.** | **Week/Contact Hours** | **Topic** | **Mode of Delivery** |
|---|---|---|---|
| 1. | I-III | Electrical and Dieelectric Materials | Classroom teaching + Guest Lectures + Exposure to the facilities available at NITT/Research Labs/Industry |
| 2. | IV-VI | Semiconducting Materials and Supercondcuting Materials | |
| 3. | VII-IX | Magentic Materials | |
| 4. | X-XII | Production of electronic Materials | |
| 5. | XIII-XIV | Optical Properties of Materials | |

**COURSE ASSESSMENT METHODS (shall range from 4 to 6)**

| S.No. | Mode of Assessment | Week/Date | Duration | % Weightage |
|---|---|---|---|---|
| 1 | One Assignment | X- XIV week | ----- | 10 |
| 2 | One Seminar and writeup | XIII- XIV week | 30 min per student | 15 |
| 3 | One cycle test | Around IX week | 1.5 h | 25 |
| 4 | **Compensation Assessment* Re-test** | XII week | 1.5 h | 25 (If any student misses 1st cycle test for medical reasons) |
| | Guest Lectures (2 lectures subjected to Institute approvals) | After VIII week | 1 h each | Nil |
| | Attendance | --------- | --------- | Nil |
| 5 | **Final Assessment *** End semester exam based on classroom teaching | Around XV | 3 h | 50 Minimum 75% attendance required for writing the semester examination as per institute norms |

***mandatory; refer to guidelines on page 4**

**COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)**

The feedback from students will be assessed based on the questionnaire prepared by the institute and expected attainment to be 75%.

**COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)**

The students are expected to attend all the classes except for medical reasons. Minimum attendance of 75% is required for writing the semester examination.

Apart from technical content and presentation, plagiarism will be checked for the assignments

**MODE OF CORRESPONDENCE (email/ phone etc)**

The Course Coordinator is available for consultation at any time.

Students can also contact me at any time through phone or by e-mail.

The phone number and email id will be given to the students at the beginning of the course

**COMPENSATION ASSESSMENT POLICY**

Retest will be conducted for the portion of the course completed.

**ATTENDANCE POLICY (**A uniform attendance policy as specified below shall be followed)

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

**ACADEMIC DISHONESTY & PLAGIARISM**

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

  The above policy against academic dishonesty shall be applicable for all the programmes.

**ADDITIONAL INFORMATION**

The Course Coordinator is available for consultation at any time.

Students can also contact me at any time through phone or by e-mail.
The phone number and email id will be given to the students at the beginning of the course

**FOR APPROVAL**

N. Ramesh Babu
**Course Faculty** _____

**CC-Chairperson** _____

**HOD** _____ 08-08-19

## Guidelines:

a) The number of assessments for a course shall range from 4 to 6.

**b) Every course shall have a final assessment on the entire syllabus with at least 30% weightage.**

c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.**

**d) The passing minimum shall be as per the regulations.**

| B.Tech. Admitted in | | | | P.G. |
|---|---|---|---|---|
| 2018 | 2017 | 2016 | 2015 | |
| 35% or class average/2 whichever is greater. | | Peak/3 or class average/2 whichever is lower | | 40% |

**e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.**

**f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.**

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.