INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

PROPOSAL FOR INTRODUCING A NEW SUBJECT

1. Name of the Department/Centre/School proposing to introduce the subject : ME
2. Name of the subject : FUNDAMENTALS OF ELECTRONIC PACKAGING
3. L-T-P and Credit loading of the subject : L-T-P : 3-0-0 Credit : 3
4. Status of the subject
   a) Specify the Session,Semester ,from which the subject is going to be offered : SPRING,2017-2018
   b) Level of the Subject : PG Level
   c) Name(s) of the Programme(s) in whose curricula this subject will be included : 1)5 th Year,MECH.ENGG. MANUF.SCIENCE & ENGG. (M.Tech Dual 5Y) UG.
   2)5 th Year,MECH.ENGG. THER. SCIENCE & ENGG. (M.Tech Dual 5Y) UG.
   3)5 th Year,MECH.ENGG. MECH.SYSTEMS DESIGN (M.Tech Dual 5Y) UG.
   4)5 th Year,MECHANICAL ENGINEERING/ENGINEERING ENTREPRENEURSHIP UG.
   5)5 th Year,MANUF. SCI & ENGG.IND. ENGG.MAN. (M.Tech Dual 5Y) UG.
   6)5 th Year,MANUFACTURING SCIENCE AND ENGINEERING/FINANCIAL ENGINEERING UG.
   7) ,PHD/MS LEVEL RS.
   8)1 st Year,MANUFACTURING SCIENCE AND ENGINEERING PG.
   9)1 st Year,THERMAL SCIENCE AND ENGINEERING PG.
   10)1 st Year,MECHANICAL SYSTEMS DESIGN PG.
   11) ,PHD/MS LEVEL RS.
   12)5 th Year,ELECT.&ELEC.COM.ENGG.MICROELECTRONICS & VLSI DES.(M.Tech Dual5Y) UG.
   13) ,PHD/MS LEVEL RS.
   14)1 st Year,MICROELECTRONICS & V L S I DESIGN PG
   d) Whether the subject will be offered as Compulsory or Elective : ELECTIVE
   e) The semester in which the subject will be offered. : SPRING
5. Prerequisite(s) for the subject, if any Please give the subject number and names) :
6. Objectives and contents
   a) Objectives : We live in the information age where electronics technology is an integral part of our lives. In recent years, the electronics industry has grown at an alarming pace as evidenced by the intrinsic pervasiveness of electronic products in our lives. A recent estimate by the semiconductor giant Intel shows that electronic product sales are expected to increase by a factor of 3 5 in the next 5 years.
   The competition, however, is fierce and technologies fast paced. We are facing an everincreasing demand in the speed and amount of information we need to transmit, communicate and process. To meet this demand and compete in the international marketplace, we have to constantly seek methods to achieve early adoption of new and emerging technologies, improve quality and reliability, and reduce cost. It is now generally recognized that the performance and price of an electronic system are ultimately limited, not so much by advancements in new device and chip technology, but by our ability to package and manufacture these individual chips into modules, substrates, boards, subsystems and systems.
   This course is designed to provide a basic knowledge of the technologies and processes required for the packaging and manufacturing of electronic products. The various aspects of packaging and the associated challenges will be discussed. The course will also cover environmental aspect of electronic packages like thermal management, reliability, effects of shock and vibration, and fan noise.

Date :

Signature of the Head/Dean of the Deptt./Centre/School

INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

PROPOSAL FOR INTRODUCING A NEW SUBJECT

b) Contents (in 100 to 150 words) : Introduction: (2)
Electronics Industry ÃÂÃÂÃÂ¢ÃÂÃÂÃÂÃÂÃÂ history, scope and challenges;
Introduction to packaging and its role in the industry
Integrated circuits, IC packaging, Semiconductor Roadmap, Moores Law

Wafer Fabrication: (3)
Crystal growth, Czochralski growth process, CVD, Lithography, Diffusion

Packaging of Electronic Systems: (18)
Different levels of packaging (substrate, PWBs, Rack systems), Interconnects, Chip carriers, Through hole components, Surface mount components, Automated Wire Bonding, Tape Automated Bonding, Flip chip technology, Printed Circuit Boards, Component placement, Routing, Lamination, Drilling and Punching of holes in PCBs, Solder Masks, Types of circuit boards.

Thermal Design (9)
Cooling systems for electronics packages heat sinks, heat spreaders, heat pipes, microchannels, actuators, fans, cold plates;
Thermomechanical issues in electronic packages.

Mechanical Design (6)
Effects of Vibration ÃÂÃÂÃÂ¢ÃÂÃÂÃÂÃÂÃÂ vibrating systems, vibration of axially loaded components, circuit boards, Theorem of Castigliano;
Mechanical design fatigue analysis of leads, creep behaviour of solder balls, Strength of connectors

Reliability (6)
Design for reliability, Life cycle, Failure Modes and Mechanisms, Reliability Metrology and Analysis, Environmental Stress Screening.

(Please attach the detailed lecture-wise breakup and/or list of experiments)

7. Names of the faculty members of the Department/Centre/School who have the necessary expertise and will be willing to teach the subject (minimum two faculty members should be willing to teach the subject). 1)Anandaroop Bhattacharya (EC-15022) (Dept-ME)

8. Do the contents of the subject have an overlap with any other subject offered in the Institute? If yes, please give details as follows. : N

a) The number and the name of the existing subject : ( )

b) Approximate percentage of overlap :

c) Reason for offering the new subject in spite of the overlap :

9. Recommended Text Books : Suhir, Ephraim, Lee, Y.C., Wong, C.P. (Eds.) Microand Optoelectronic Materials and Structures: Physics, Mechanics, Design, Reliability, and Packaging, Springer, NY, 2007.

R. Ulrich and W.D. Brown, Advanced Electronic Packaging, Second Edition, IEEE Press, Piscataway, NJ, 2006. ISBN10: 0471 466093.

M. Pecht, Plastic Encapsulated Microelectronics, John Wiley & Sons, New York, 1995.

Lau, C.P. Wong, J. L. Prince, and W. Nakayama, Electronic Packaging: Design, Materials, Process and Reliability, McGrawHill, New York, 1998.

Rao Tummala, Fundamentals of Microsystems Packaging, McGrawHill, New York, 2001.

Date :

Signature of the Head/Dean of the Deptt./Centre/School

INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

PROPOSAL FOR INTRODUCING A NEW SUBJECT

10. Reference Books	:	ASME Journal of Electronic Packaging IEEE Transactions on Components, Packaging and Manufacturing Technologies
11 Names of the Departments/Centres/Schools/ Programmes whose students are expected to register for this subject	:	1)Advanced Technology Development Centre. 2)Electronics and Electrical Communication Engg.. 3)Mechanical Engineering

Date :

Signature of the Head/Dean of the Deptt./Centre/School