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**From:** "Manoj K. Harbola" <mkh@iitk.ac.in>

**Date:** Wed, March 13, 2013 9:59 am

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 Subject: Minors' committee report  
 From: "Manoj K. Harbola" <[mkh@iitk.ac.in](mailto:mkh@iitk.ac.in)>  
 Date: Tue, March 12, 2013 4:48 am  
 To: [imanna@iitk.ac.in](mailto:imanna@iitk.ac.in)  
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Professor I. Manna,  
Chairman, Senate

Sir,

Attached with the mail is the report of the Minors' committee for consideration by the Senate.

Best regards,  
Manoj K. Harbola

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**Attachments:**

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## **Report of the Minors' committee**

### **Preamble:**

The first Minors' committee was constituted vide office order No. DIR/IITK/2011/00-83 dated July 14, 2011. The report of this committee was submitted to the senate on May 22, 2012. The report was passed by the senate in its meeting held on September 3, 2012. However, the Senate also desired that a policy document outlining the methodology of running this programme be prepared and brought to the Senate. As such a committee was formed by the Director vide office order No. DIR/IITK/2012/93 dated November 02, 2012. The committee was requested to submit its initial report by January 15, 2013. The committee could not meet during the months of November and December, 2012. It has met twice during the current semester and deliberated over the issues of running the Minors' programme. I put on record the initiative taken by the Chairman, SUGC, to rejuvenate the committee. Before starting with the report of the committee, I also wish to apologise for the delay in calling the meetings of the committee and in preparing the report.

### **The report:**

The committee went over the Minors' committee report passed by the senate and discussed what next steps are to be taken so that a large number of students can take minors. Various additional points discussed by the committee are as follows:

(1) The committee felt that ideally any student who wishes to do a minor should be able to do so. However, the constraint put by the class sizes does not make it possible to offer a minor to minimum 20% of the batch size (the batch size being UG strength per batch of the department offering a minor). For example, a department may have a batch size of 120. For them to accommodate additional 24 students may be difficult and as such they may be reluctant to offer any minor. Thus it was felt that a department should offer a minor and accommodate at least 20% of their batch size or 10 (whichever is lower) number of students in a compulsory departmental course, if that course forms a part of the minor. In other cases, the lower limit should remain a minimum of 20% of the batch size. If the number of students exceeds the number that a department can accommodate, the department should clearly state the criterion they are going to apply to limit the number of students. This limitation applies only in the first course of a minor. In subsequent courses this limit does not apply to students who have already declared that they wish to complete the minor.

(2) Departments involved in offering a course should also evolve criteria for a student to continue in a minor in case they earn an F grade or drop a course of their minor for some other reason.

(3) To maintain transparency in applying the criterion to limit the number of students or their continuing to remain in a minor in a minor, the departments involved in the minor should make their policies clear in this regard when they declare their Minors.

(4) Since the number in each department is restricted, to accommodate all the students who wish to a minor, each department must be asked to offer Minors.

(5) It is reiterated that institute take, through SUGC, the responsibility of running the Minors till the programme has become stable.

(6) It is also recommended that the teaching loads of departments running a minor be accounted for in an appropriate manner.

(7) In addition to the Minors offered so far, the Minors committee also decided it is going to ask the students to suggest Minors that can be made using courses already fixed in the tentative timetable.

M.K. Harbola  
Convener, Minors' committee

**Attached:**

- (1) Report by the Ist Minors' committee passed by the Senate;
- (2) Complete list of Minors that have been offered by various departments.

## Report of the Minor Committee

The Minors committee was constituted vide office order No. DIR/IITK/2011/00-83 dated July 14, 2011 and has the following members:

Prof. M.K. Harbola (Physics) Convener; Prof. P. Bose (Civil); Prof. A. Jain (CSE); Prof. Deepak Gupta (MSE) and Prof. C. Venktesan (Aerospace).

After the initial meetings where Prof. N. Misra (Member, empowered committee) and Dr. N. Guha (HSS) were special invitees, the committee sent its interim report to all the departments requesting them to come up with minors that they will be able to offer.

The final recommendations of the committee are:

### **Types of minors to be offered**

The ARC has recommended that the Minors should be taken from outside the department and specialization within the department should not be considered for a Minor. However, the committee feels that thematic Minors are also possible within a student's programme with an aim to give a direction to selection of departmental electives by the students. Nonetheless, for successful initiation of the Minors programme, the institute should start with Minors only from outside the department. Once the Minors offered initially become stable, the scope of Minors should be enlarged to include specialization from within the department. Keeping this in mind the committee recommends that initially two types of minors, departmental and interdisciplinary, listed below should be offered:

- (1) The Minors offered (27 to 36 credits) by a department should be of sufficient broad interest to encourage students to take them. In this context it was felt that a proper combination of basic courses in a theme may make a good minor. This is what one would normally call a **departmental Minor**. These minors will be available to students from programmes other than the department that is offering them (the only exception is for students from economics programme; see point 3 below).
- (2) Different departments should cooperate amongst themselves to offer Minors with courses from more than one department. This may be called an **interdisciplinary thematic Minor**. This type of Minor will be open to all students, including those belonging to departments offering the minor.

Since HSS department has many subjects within its ambit, the ARC has suggested that HSS can offer more than two minors. The committee has the following recommendation on it.

- (3) Students from BS (Economics) programme are allowed to take all Minors within HSS, except those with all their courses in economics.

- (4) The structure of Minors for students in BS (Engg. Sc.) should be looked into by the committee for Engineering Sciences.
- (5) For effective functioning of Minors, it is absolutely necessary that once a course is declared to be a part of a Minor, ***it must be offered at least once in an academic year***. Further, should it become necessary to withdraw a Minor at a future date, it should be done only after ensuring that students who have already initiated taking courses in this Minor are given full opportunity to complete the Minor.
- (6) The first course to be taken to earn a Minor should not require any prerequisite other than the institute core and ESO courses. Subsequent courses may not have any prerequisites or have only the previous courses of the Minor as prerequisites.

### **Implementation aspects of minors**

To make Minors programme successful, its effective implementation is of utmost importance and the following suggestions are given in this connection:

- (1) A Minor is defined by outlining right in the beginning the (i) list of courses; (ii) semester in which these courses are going to offered; and (iii) time table slot for these courses. Otherwise a student may not be able to streamline their courses to earn a Minor.
- (2) Collection of courses in a Minor represents an academic content. Therefore the DUGC of the student's programme should decide which slot, OE, DE, ESO or HSS should be used by the student to earn a Minor.

***The remaining implementation aspects address how to ensure that a student who has initiated a Minor is able to do so smoothly, while not over burdening popular Minors.***

- (3) The committee recommends that students be allowed to declare their choice of Minor anytime after having completed the first course needed for it. This recommendation may be seen in conjunction with point (4) below.
- (4) The ARC has suggested that the cap on courses for minors should not be less than 20% of the batch size. This will help in controlling the class size of popular Minors. However, this may also unfairly deny a student ability of complete a Minor after having initiated it (that is, after having taken at least one course of that Minor). Therefore, to balance these two conflicting aspects, the committee recommends that the 20% cap should be enforced only in the first course a student takes for a Minor. However, the cap should be relaxed for the second and onwards courses in a minor to accommodate those students who have already declared their intention to take this minor. This is further illustrated with two examples below:

- a) For courses A, B and C of a Minor in great demand, course A may follow 20% cap and it is pre-requisite for courses B and C. This way class size may be controlled at the stage of course A. After having taken course A, should a student declare their choice of this Minor, they should not be denied courses B and C.
- b) For courses A, B and C of a Minor, when there is no concern for the class size, the Minor can be organized as in example (a), or without any sequencing of the courses.

### **Additional Suggestions**

- (1) The issue of time-table slots for courses of minors should be looked at very carefully. This report, therefore, may be considered by the Time Table Committee.
- (2) We request the departments to provide more Minors.
- (3) The Senate may nominate an inter-departmental platform, possibly through SUGC, to facilitate
  - a) Discussion on creation of interdisciplinary Minors, which not been proposed so far but are highly desirable.
  - b) Constant dialogue with students for suggestions on Minors with respect to (i) new Minors (ii) functioning of existing Minors (iii) the question if Minors should be made compulsory for all students and (iv) any other issues that may arise from time to time.
- (4) For the minors programme to take off effectively, it is suggested that initially the institute coordinate (through SUGC directly or through a subcommittee of the SUGC) the running of 5 to 10 minors to ensure that these are offered compulsorily in a manner similar to the core courses. Some of these Minors are as proposed in this report.

Manoj K. Harbola

## Minors proposed by the Departments

Many departments have responded to the committee report and agreed to its suggestions. The following Minors have been suggested.

### AE: Minor in “Aerospace Engineering”

- i) AE-201 Introduction to Aerospace Engineering (Compulsory) (5credits: modular)  
*Any three of the following four courses:*
- ii) AE-211 Incompressible Aerodynamics (11credits)
- iii) AE-321 Flight Mechanics –I (9 credits)
- iv) AE-331 Introduction to Aerospace Structures (9 credits)
- v) AE-650 Fundamentals of Aerospace Propulsion (credit to be mapped)

### BSBE: Minor in Tissue Engineering

BSE211: Organ system, Physiology and Anatomy

BSE411: Biomaterials

BSE421: Introduction to Tissue Engineering

The students are also expected to do ESO206 (Principles of Biotechnology) course.

### Chemical Engineering: Two Minors

- 1) ChE 331 (Chemical reaction engineering)
- 2) ChE 381 (Process control)
- 3) ChE 611 (Transport phenomena)

and

- 1) CHE251 Chemical process calculations
- 2) CHE261: Chemical Process Industry
- 3) CHE331: Chemical reaction engineering
- 4) CHE313:Mass Transfer

### Civil Engineering: Minor in the area of *Earth Sciences*.

This minor will consist of a string of three courses: CE 322, CE 422 (section 3.6) and CE 642 (existing post graduate course). The minor will be open to all students other than the students in Civil Engineering. CE 322 is a course that will only be open to non-CE students since it has substantial overlap with CE 321. The course structure is given below:

**L-T-P-A Credits Title Number**

3-0-0-0 09 Earth Sciences CE322

The courses CE 322 and CE 422 has already been approved by the Senate in the course list. The contents have been sent to SUGC for approval. The CE 642

**Electrical Engineering:**

*Microelectronics/Digital systems*

EE 200 Signals, Systems and Networks

EE 210 Microelectronics – I

EE 311 Microelectronics II/EE 370 Digital Electronics & Micro-processor Technology

*Power*

EE 200 Signals, Systems and Networks

EE 330 Power Systems

EE 360 Power Electronics

*Communications and Signal Processing*

EE 200 Signals, Systems and Networks

EE 320 Principles of Communication

EE 321 Communication Systems/EE 301 Digital Signal Processing

*RF and Photonics*

EE 200 Signals, Systems and Networks

EE 340 Electromagnetic Theory

EE 642 Antenna Analysis& Synthesis/EE644 Optical Communication/EE 648

Microwave Circuits

*Controls*

EE 200 Signals, Systems and Networks

EE 250 Control System Analysis

EE 650 Basics of Modern Control Systems

**HSS: Two disciplinary minors by the English group:**

**Minor 1. Linguistic Theory**

ENG122: Introduction to Linguistics (compulsory) The other two courses can be selected from ENG 423:Current Issues in Linguistics, ENG 443:Natural Language Semantics or ENG 448:Languages of South Asia.

**Minor 2. English literature:**

The student can choose one course each from the following groups:

a) Literary categories: ENG 431:Indo-Anglian Novel, ENG 433:Modern Drama, ENG 434:Modern British and American Novel, ENG 437:Indian Literature, or ENG 438:



## Postcolonial Literature

b)Thematic concerns: ENG 432:Literature and Ideology, ENG 439:Literature and Censorship, ENG 445: Literature and the Individual, or ENG 446:Literature and Adaptation

c)Approaches to Literature: ENG435: Topics in Literary Movements, ENG 436: Writer's Vision of the Future, or ENG 440:Topics in Literary Genres.

### **Materials Science and Engineering: One Minor in "Functional Materials":**

(Any 3 courses out of following five course):

1. MSE693N: Materials Science Technologies for Applications in Life Sciences
2. MSE631: Electroceramic Materials and Applications
3. MSE628: Electronic Devices and Characterization (Pre-requisite: MSE303 or equivalent)
4. MSE 624: Energy Materials and Technologies
5. MSE604: Science and Technology of Thin Films and Device Fabrication

### **Mathematics: Two Minors:**

#### **Analysis**

MTH 301 Analysis-I

MTH 403 Complex Analysis

MTH404 Analysis-II/ MTH405 Functional Analysis/(New course) Several Variable Calculus and Geometry

#### **Applied Mathematics**

MTH 308 Principles of Numerical Computation

MTH 428 Mathematical Methods

MTH 551 Mathematical Modelling

### **Mechanical Engineering: Two Minors**

#### **Modern Manufacturing Techniques**

*Any three out for following four courses*

ME662 Machining Science II

ME774 Bio-MEMS

ME751 Computer Aided Engineering Design

ME761 CAM

#### **Computational Techniques in Mechanical Engineering:**

*Any three out for following four courses*

ME623 FEM in Engineering Mechanics  
ME 630 Numerical Fluid Flow and Heat Transfer  
ME685 Programming and Numerical Methods  
ME751 Computer Aided Engineering Design

**Departments that have not offered any minors so far:**

*Chemistry; Computer Science and Engineering; Groups of HSS other than English; Industrial and Management Engineering; Physics*