

Government Polytechnic Mumbai



Curriculum Philosophy (P19R Outcome based Curriculum) (Sandwich Pattern)

Preface

The quality of technical education is dependent on a well-developed curriculum. The curriculum should not focus only on technical contents but it should impart necessary skills that help students to learn how to cope with new challenges. It should prepare them for lifelong learning once they enter the workforce. It is very necessary that the diploma students should be well updated with the latest technological skills and advancements, to meet industrial demands and contribute to nation building. With this thought we have designed an outcome based curriculum keeping in view the latest industry trends and market requirements. Outcome based curriculum will be offered to students 2019 onwards. Outcome based curriculum is student centric rather than teacher centric. It is composed of basic science and engineering having focus on fundamentals, significant discipline level courses and electives. Six month Inplant training was included in the P19 curriculum to make the student understand industry requirements, have hands-on experience and take up project work relative to industry in their final year. This practice is continued in the P19R Scheme also. It is well Said by Abraham lincon that “Purpose of education is not to build the career of a student but to create a good human being”. In view of this and as per AICTE (December 2020) guidelines three Universal Human Values courses are introduced in P19R scheme. These features will allow the students to develop a problem solving approach to face the challenges in real life.

In outcome based education, Programme Outcomes, Programme specific outcomes, Course outcomes are defined first and then course contents are designed to achieve these outcomes. During curriculum implementation the teacher will analyze the contents and then develop the learning experiences which will ensure accomplishment of outcome. The industry experts, being the main stakeholders, are actively involved, while designing the curriculum. Outcomes are validated by industry experts, so it will produce industry ready pass outs and increase the employability of students.

Salient features of this curriculum are:

1. Outcome based curriculum with well defined outcomes for each course
2. Incorporation of six month Inplant training.
3. Built in flexibility to the students in terms of elective courses
4. Course on Entrepreneurship and Start-up to encourage entrepreneurial skills
5. More weightage for practical's in terms of contact hours to increase skill component
6. Student Centered Activity in first, second and third semester to inculcate the habit of

physical and mental fitness right at the start.

7. One MOOC in each semester in order to inculcate self learning capability in students.
8. Experiential learning based Universal Human Values courses to be conducted during orientation at the beginning of the semester.and continued during SCA hours.
9. A list of experiments with clear outcomes.
10. Introduction of Business Communication course with additional Infosys Springboard online courses /related free online courses in place of Communication Skills course.

The New Curriculum has been designed to better meet the needs of the industry considering evolving technological trends and implications for the engineering workforce.This curriculum is also expected to enhance employability skills and develop well trained Diploma Engineers who have the knowledge and the skills to get engineering solutions for real-world problems.

I gratefully acknowledge the time and efforts of all those who contributed to design the curriculum, especially the contributions of chairperson and members of Board of Studies and Programme Wise Board of Studies. I acknowledge all the stakeholders, alumni and subject experts.

Principal
Government Polytechnic Mumbai

Outcome Based Education Philosophy

As the National Board of Accreditation (NBA) is focusing on the adoption of Outcome Based Education (OBE) approach, Government Polytechnic, Mumbai has adopted the OBE approach for design of curriculum P19 to all programmes. This practice is continued in the P19R Scheme also. NBA adopted Outcome based Model because, OBE is “Student Centric ” rather than “Teacher Centric”. OBE focuses on the graduate attributes or outcomes after completing an academic programme. Outcome based approach means knowing what you want to achieve and then taking the steps to do so. Starting with a clear picture of what is important for students to be able to do and then organizing the curriculum delivery and assessment to make sure learning happens.

Some Benefits of OBE are

1. Satisfying the need of stakeholders
2. More specific and coherent curriculum
3. Student centric

Components of the OBE are

1. Outcome based curriculum: What students should be able to do after learning the curriculum?
2. Outcome based Teaching Learning: Prepare and train the students to achieve the outcomes.
3. Outcome based assessment: Measure what the student has achieved? Identify which outcome has not been attained by the students.
4. Remedial measures: Take the remedial measures so that students can achieve that outcome.



Fig1. Outcome Based Education Philosophy

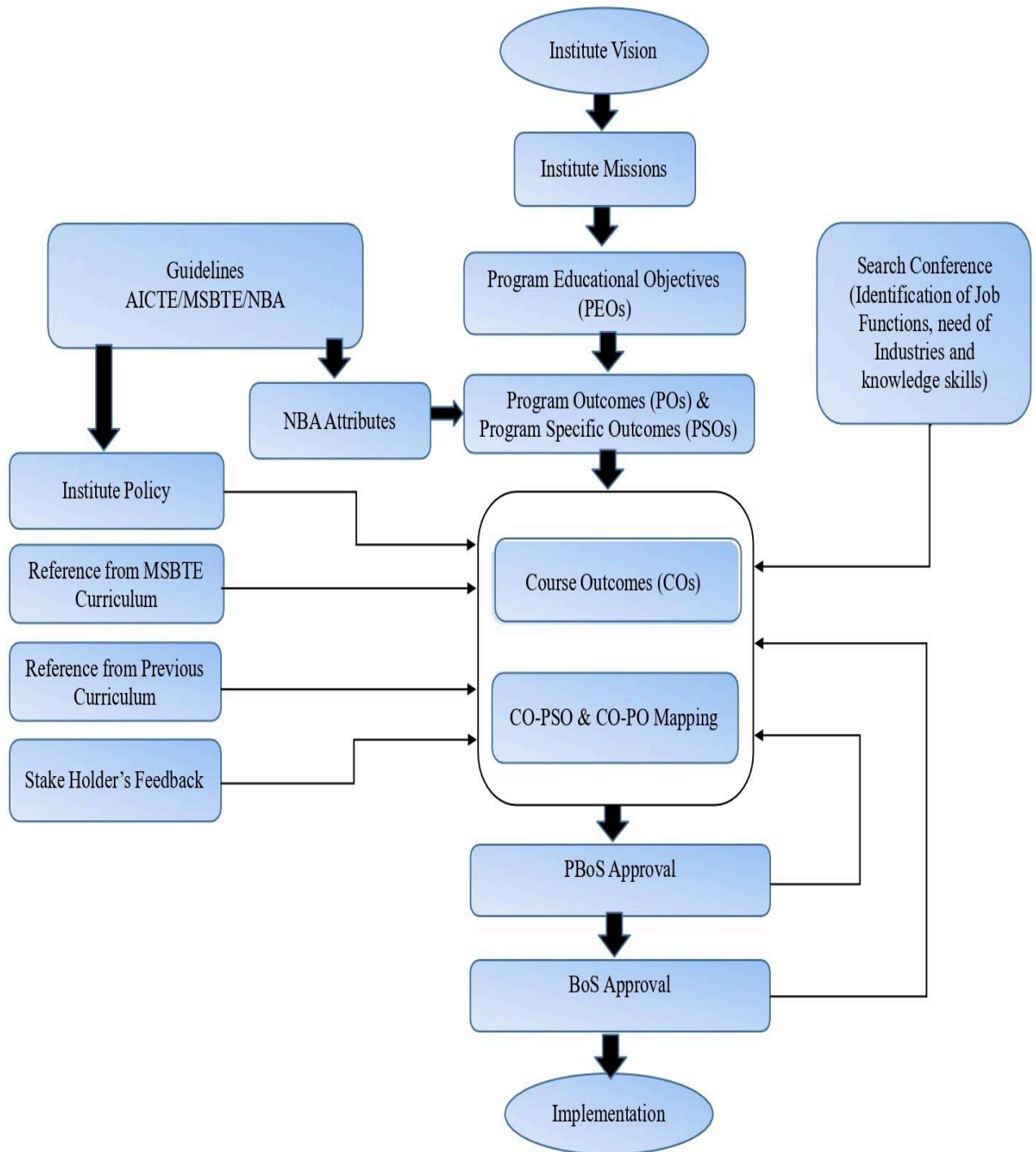


Fig. 2 Curriculum Design Process

Figure 1 shows outcome based education philosophy. Vision and mission statements will be finalized first, and then each programme will finalize Programme educational objectives (PEOs). Programme outcomes (POs) are given by the NBA. Each programme will finalize their Programme Specific Outcomes (PSOs). Then course outcomes (COs) are finalized and then content detailing of each course will be carried out.

Figure 2 shows our curriculum design process/philosophy. Figure is self explanatory. Important steps are given below. Process starts with formulation of vision mission statements of the institute.

1. Formulation of Vision Mission Statements

Vision Mission statements of the institute are finalized using the following steps.

Bottoms up approach

Involvement all stakeholders

Discussion, Brainstorming sessions among all stakeholders

Gap analysis or SWOT analysis

Challenges before the institute

What are the immediate and long term goals

After following these steps vision and mission statements of the institute is finalized as

Institute Vision

Transform Knowledge into Work

Institute Mission

We are committed for

- Quality education for lifelong learning
- Need based educational programmes through different modes.
- Outcome based curriculum implementation
- Development and up gradation of standard laboratory practices
- Promoting entrepreneurial programmes

We believe in ethical, safety, environmentally friendly practices and teaching learning innovations.

Once, the vision mission statements are finalized. Using the same procedure, vision mission statements of each programme are finalized.

2. Programme Educational Objectives (PEOs)

The Programme educational objectives of a diploma program are the statements that describe the expected achievements of diploma holders in their career, and also in particular, what they are expected to perform and achieve during the first few years after diploma. The PEOs, may be guided by global and local needs, vision of the Institution, long term goals etc. For defining the PEOs the faculty members of the program have continuously worked with all Stakeholders: Local Employers, Industry, Students and the Alumni

3. Programme Outcomes (POs)

Programme outcomes are given by the NBA. They are

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis:** Identify and analyze well defined engineering problems using codified standard methods.
3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. **Engineering tools experimentation and testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society sustainability and environment:** apply appropriate technology in context of society sustainability environment and ethical practices
6. **Project management:** Use Engineering Management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
7. **Life-long learning:** Ability to analyze individual needs and engage in updating in the context of technological changes

4. Programme Specific Outcomes (PSOs)

In addition to NBA defined POs, these outcomes are specific to a program namely, Civil, Computer, Electrical, Electronics, Mechanical, Information Technology, Instrumentation, Rubber Technology, Leather Technology, and Leather Goods and Footwear technology, Artificial Intelligence and Machine Learning..

5. Course Outcomes (COs) and Content detailing

“Statements of observable student actions that serve as evidence of the Knowledge, Skills and Attitudes acquired in a course”. Each course is designed to meet (about 4 to 6) Course Outcomes. The Course Outcomes are stated in such a way that they can be actually measured. “Blooms Taxonomy” is used for framing course outcomes.

Course Outcome statements are broken down into two main components:

- **An action word** that identifies the performance to be demonstrated;
- **Learning statement** that specifies what learning will be demonstrated in the performance; Once the COs are finalized, content detailing of each course is done as per the course outcomes. For content detailing inputs are taken from stakeholders, MSBTE curriculum and industry persons.

6. CO-PO and CO-PSO mapping

When all COs are finalized, COs are mapped with POs and PSOs. During mapping, if it is found that a particular PO or PSO has not been addressed by any CO of the courses in the respective term curriculum, then it is considered a gap. This gap is addressed by conducting additional activities like expert lectures, industrial visits, assignments etc.

7. Approval in PBOS and BOS meetings.

After CO-PO and CO-PSO mapping, content detailing is done. Then the curriculum is kept for approval in Programme wise Board of studies (PBOS) meetings. Each programme has its own PBOS committee whose structure is as follows.

Head of Department concerned	Chairman
Two senior Lecturers	Members
One expert from the neighboring institute	Member

Nominee from the board of technical Education	Member
One expert from the local industry	Member
Departmental Curriculum Coordinator	Member Secretary

Suggestions given by PBOS members are incorporated in the curriculum and then it is put in front of the Board of studies (BOS). Structure of BOS is as follows.

Representative from Industry	Chairman
Principal	Invitee
Head of All departments	Member
Local Experts of all programmes	Member
Nominee from the board of technical Education	Member
In charge CDC	Member Secretary

Suggestions given by BOS members are incorporated in the curriculum and the finalized approved curriculum is then offered to the students.

8. Institute Policies

As per the guidelines given by All India Council of Technical Education (AICTE), Maharashtra State Board of Technical Education (MSBTE), Directorate of Technical Education (DTE) and National Board of Accreditation(NBA). Institute policies about curriculum design are decided in the meeting of all Heads of the departments.

Being an autonomous institute, we revise our curriculum after every 4 to 5 years. Earlier it was revised in 2019. Curriculum 2019 was outcome based curriculum. As per instructions received from AICTE and NBA, Outcome based curriculum should be offered to students,we adopted Outcome based curriculum in 2016 for Civil engineering and Mechanical engineering programs. In 2019 it was adopted by all programs.. In 2019, we conducted a search conference in all departments to identify a set of skill components that should be developed in students at the end of the diploma programme. Here we got suggestions from industry experts as well as from stakeholders about incorporation of six month Inplant training in the curriculum itself to give awareness about industry culture to students. So in 2019 we revised our curriculum. It is outcome based with six months Inplant training. We got approval from AICTE also. So now all courses are sandwich patterns. This scheme is called the P19 scheme. In 2019 it was offered to first year and in subsequent years it was offered to second year and third year. Once the curriculum framework is finalized at the institute level, as per the demand of the industry, course contents can be changed at any level without disturbing the framework. This is necessary to satisfy the present demand of the industry and remove the curricula gaps as per the advancement in technology. These practices are continued in the P19R curriculum scheme also.

P19 R curriculum is 186 credits (221 teaching hours). As per AICTE norms given in Approval Process Handbook 2015- 16, contact hours per semester should be 525/555 hours and number of teaching days should be 75 in a semester (7 hours per day i.e. 35/37 hours per week). Total weeks for teaching are 15. One week will be for the unit test exam. Total term will be 16 weeks. So we decided to design the P19R curriculum with 186 credits.

Definition of Credit:

- 1 Hr. Lecture (L) per week 1 credit
- 1 Hr. Tutorial (T) per week 1 credit
- 2 Hours Practical (P) per week 2 credit
- 40 inplant training Hours per week 1 credit

Following programmes have incorporated six month Inplant training in their curriculum, wherein students undergo Inplant training in the industries during last semester:

1. Civil Engineering
2. Computer Engineering
3. Electrical Engineering
4. Electronics Engineering
5. Information Technology
6. Instrumentation
7. Mechanical Engineering
8. Leather Technology
9. Leather Goods and Footwear Technology

Maximum 20 credits are allotted for Inplant training.

Curriculum Framework

Semester wise Credits and Marks distribution is given below.

Curriculum Framework for All Programmes

Year	Semester	Credits	Teaching hours	Marks
First	First	32	37	650 to 850
	Second	32	37	650 to 850
Second	Third	32	37	650 to 850
	Fourth	35	35	650 to 850
Third	Fifth	35	35	650 to 850
	Sixth	20	40	200
Total		186	221	3450 to 4450

Apart from technical courses, in the first 3 semesters, 3 Universal Human Values courses are included carrying 2 credits each.

In order to inculcate self learning capability in students MOOC (Massive Open Online Course) in each semester is incorporated in the curriculum of all programmes.

As per AICTE model curriculum 60% weightage is given for external examination and 40% weightage is given for internal examination as far as theory is considered. For all courses in all programmes 60+20+20 pattern of examination is followed. Two internal unit tests are conducted for theory courses in a semester having maximum marks 20. End semester examination of 60 Marks is conducted at the end of the semester. Addition of two test marks with end semester examination marks will give total marks out of 100.

After the test as well as end term examination bitwise analysis of the answer book of each student will be done in order to calculate course outcome attainment. From course attainment, PO and PSO attainment will be calculated. If attainment is not satisfactory remedial measures are taken by the respective department.

For courses, having term work, continuous assessment is compulsory.

In the sixth semester, students are going for Inplant training. Before going into industry at least he/she should learn prerequisite knowledge and skills required for his/her programme. A student will be eligible for registration of Inplant training only when he/she earns minimum 50 credits at the end of 4th semester.

Award of Diploma

For the award of diploma in all programmes, all courses of 5th semester and Inplant training will be considered along with weightage of third and fourth semester courses as shown in following table.

All courses of fifth semester	650 to 850 Marks
Inplant Training	200 Marks
Consolidated marks of third and fourth semester*	200 marks
Total marks	1050 to 1250 Marks

*Consolidated Marks of third and fourth semester – the total marks of third and fourth semesters are converted to 100 marks each. These marks are then added (3rdSem + 4thsem) as 100+100 = 200 marks.

Implementation of MOOC:

In each semester all programmes will offer a MOOC. Programme heads should see that this MOOC is freely available to all students; it should not be financial burden on students. Sufficient number of lectures/sessions should be available for the course which is offered through MOOC. For 1 credit per week one lecture or one session of 45 minutes to 60 minutes should be available.

For MOOC courses online examination is conducted by a service provider, for example spoken tutorial. Spoken tutorial issues certificates. Programme head should collect certificates of all students semester wise and submit MOOC completion reports to the controller of examination.

As the exam is conducted by some other agency, marks are not taken into consideration. They do not reflect on the result. But unless and until students complete certification, credits of MOOC are not awarded to the students. Student must earn 186 credits for the award of diploma.

Students can complete MOOC at any time throughout the tenure of their diploma. Course or exam registration of students in any semester will not be blocked due to incompleteness of MOOC. Whenever a student completes certification, in that term, in the result of term end examination credits will be allotted.

If a MOOC is performed through NPTEL, the course is free but for getting certification, students have to pay extra fees. In such a case, to avoid financial burden on students, MCQ based examination of such courses will be conducted by respective departments and certification can be provided by respective departments. For certification, passing criteria of 40% should be used.

Course Codes:

Entire curriculum of all Programmes is divided into five levels. These levels and their percentage is given below.

Level1- Science and Humanities (10 to 15%)

Level2- Core Technology (25 to 30%)

Level3- Applied Technology (45 to 50%)

Level4- Diversified Courses (5 to 10%)

Level5- Management courses (3 to 5%)

Course Coding Scheme:-

Course Code abbreviations	Definitions
HU	Humanities
SC	Science
MG	Management
CE	Civil
CO	Computer
EC	Electronics
EE	Electrical
IT	Information Technology
IS	Instrumentation
RT	Rubber
LT	Leather Technology
LG	Leather Goods and Footwear
ME	Mechanical Engineering
UV	Universal Human Values

Course codes are formed as:

First two letters are course code abbreviations. Then two digits and the alphabet “19R” refers to the 2019 Revised curriculum. Next digit is the level number and the last two digits are the serial number from that level.

For example: HU19R101 (Communication Skill)

HU- It belongs to Level 1 Science & humanities

19R- 2019 Revised curriculum

1- Level 1

01- Sr. No of Level 1 courses.