	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	0	0	3	2	2	1	1	0	2
CO2	2	1	1	0	0	3	1	2	1	1	0	2
CO3	2	1	3	0	0	2	1	1	2	2	1	1
CO4	2	0	1	1	2	2	2	1	1	1	0	2
CO5	2	1	2	0	1	2	2	1	1	1	0	2

Course Objectives for Science of Living Systems:

1. Knowing basic concepts of biology with their application in more meaningful way
2. Understanding natural biological processes in view of increasing efficiency of engineering
3. Discussion on biological solutions resolving problems caused by technical revolution
   Introduction of concept of designs and environmental engineering to Civil engineers

4a. Introduction of biomaterials and nanomaterials to Metallurgy and Material Engineering.

4b. Introduction of biomechanics to Mechanical Engineering.

4c. Introduction of cell to cell communication and biosensors to Electronics and Telecommunication Engineering.

4d. Introduction of bioinformatics and computational biology to Computer Science and Information Technology.

4e. Introduction of biomedical instrumentation and bioimaging (ECG/EEG/CT Scan etc.) to Instrumentation & Control Technology and Electrical Engineering.

5. Introduction of interdisciplinary topics like energy transduction, cellular evolution, genetic, tissue and chemical engineering.

Program outcomes (POs)-12 Graduate Attributes

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

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

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

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.

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

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear

instructions.

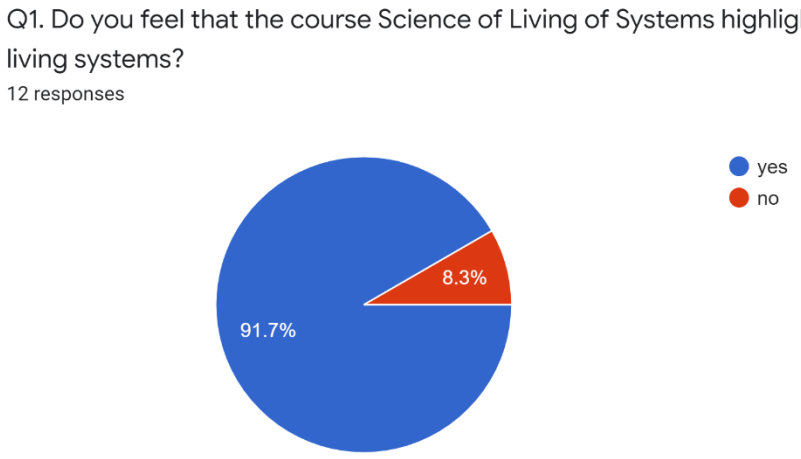
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Course Objective	Description
CO-1	Knowing basic concepts of biology with their application in more meaningful way
CO-2	Understanding natural biological processes in view of increasing efficiency of engineering
CO-3	Discussion on biological solutions resolving problems caused by technical revolution
CO-4	Understanding use of engineering and technology in biology in branch specific manner
CO-5	Introduction of interdisciplinary topics like energy transduction, cellular evolution, genetic, tissue and chemical engineering.

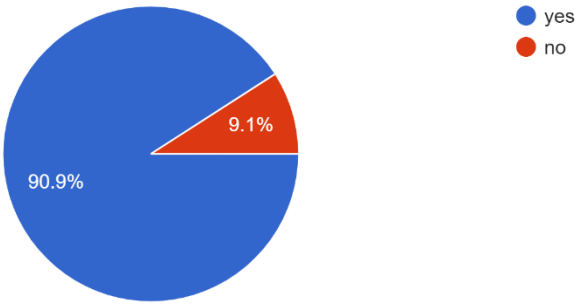
Exit Survey Response 2017-18:

12 responses



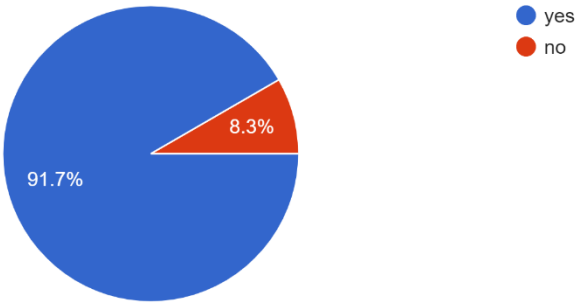
Q2. Are you of the opinion that Biology and Engineering domains have crosstalk?

11 responses



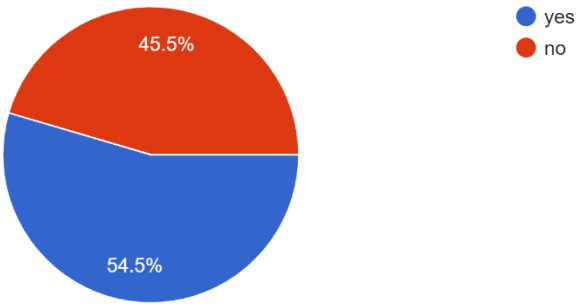
Q3. Have you realized that this course has re-framed your understanding about biological systems from engineering perspective

12 responses



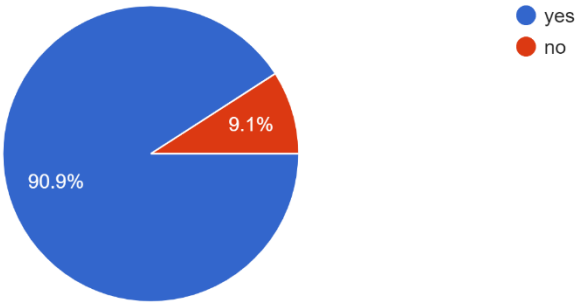
Q4. Does this course link basic biological information about to the engineering concept of molecules polymers?

11 responses



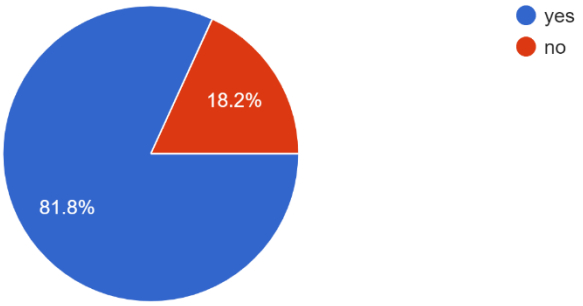
Q5. Does this course describe energy conservation optimised in biological systems through the process of photosynthesis and respiration?

11 responses



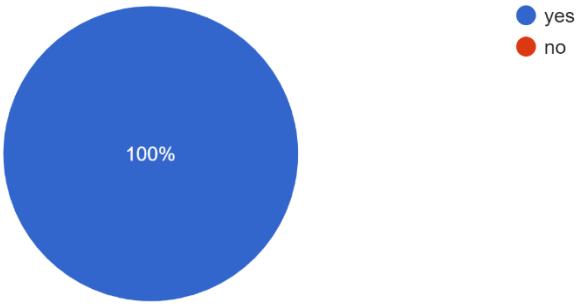
Q6. Can recent advancements and technologies like genetic engineering optimise plants, animals and microorganisms

11 responses



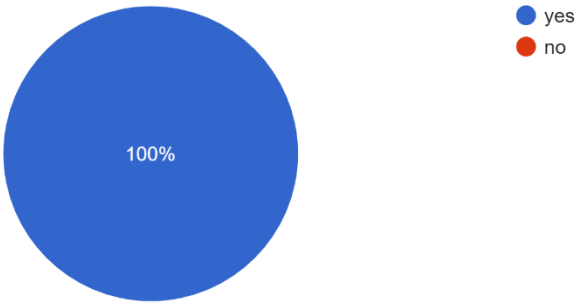
Q7. Do you think transport, communication and defense mechanisms of living systems inspires engineering research

12 responses



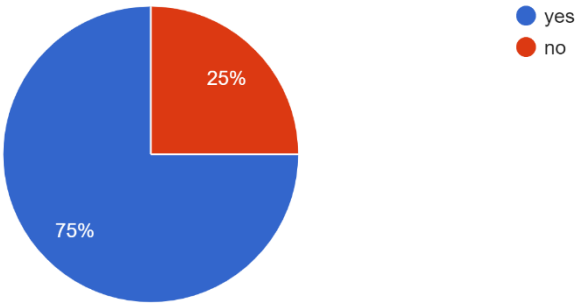
Q8. Could you appreciate that a part of this course offers discussion of biology related technologies in a branch specific manner

12 responses



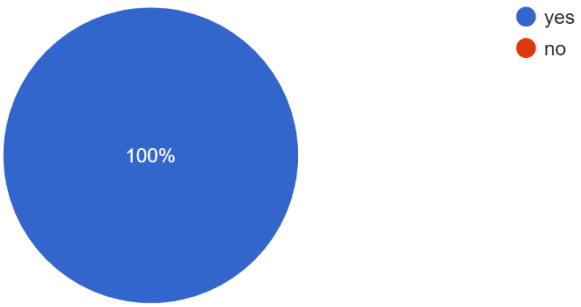
Q9. Did you find branch specific assignments of this course as opportunities for updating knowledge and enhancing teamwork?

12 responses



Q10. Did you think to certain extent, basic information about biology is necessary for every engineer?

12 responses



(Indirect) CO attainment for 2017-18

Sr No	Questions mapped to CO	% attained	Target	%attained * weightage for Indirect assessment
CO-1	1, 4	73.1	60	
CO-2	2, 5	90.9	60	
CO-3	3,7	95.4	60	
CO-4	8,9	87.5	60	
CO-5	6,10	90.9	60	

(Direct) CO Attainment (2017-18)

Course attainment with different evaluation modules

Course Outcome	Assessment	Marks	Weightage Total	Results
CO-1	Test I, ESE	30	30	Y
CO-2	ESE	10	10	Y
CO-3	ESE	10	10	Y
CO-4	ESE	10	10	Y
CO-5	ESE, Test II	10	10	Y

Course outcome	AAK (Mech I, Comp, IT)	MRS (Prod, Mech II Instru)	MKR (Civil, Electrical, Meta)	Total (average)
CO-1	73.4%	79.2%	74.16%	75.58%
CO-2	71.8%	68.1%	72.33%	70.74%
CO-3	66.66%	76.07%	71.57%	71.4%
CO-4	68.2%	72.18%	67.21%	69.19%
CO-5	75.75%	69.66%	66.22%	70.54%

Course Outcome Assessment

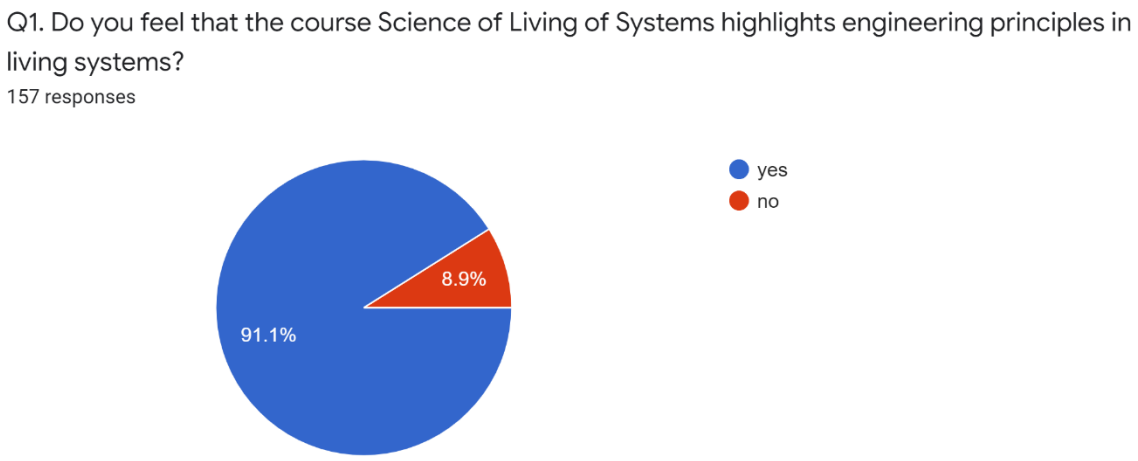
CO Assessment	Test 1	Test 2	ESE
CO-1	Q 1	-	Q1
CO-2	-	-	Q2
CO-3	-	-	Q3
CO-4	-	-	Q4
CO-5	-	Q 2	Q5

CO attainment (Direct and Indirect) 2017-18

calculation with direct and indirect weightage

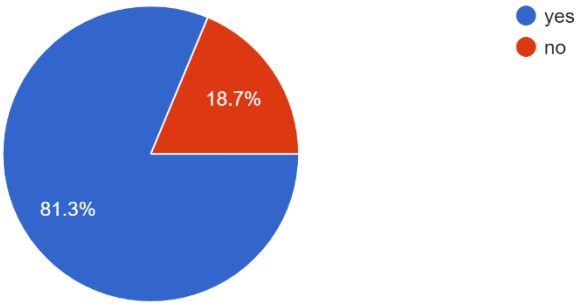
Co	T1+T2+ESE * 0.8	Exit survey responses* 0.2	Final CO attained	Target achievement 60%
CO-1	75.58 X 0.8	73.1 X 0.2	75.08	Attained
CO-2	70.74 X 0.8	90.9 X 0.2	74.77	Attained
CO-3	71.4 X 0.8	95.4 X 0.2	76.2	Attained
CO-4	69.19 X 0.8	87.5 X 0.2	67.83	Attained
CO-5	70.54 X 0.8	90.9 X 0.2	73.53	Attained

Exit Survey 2018-19: 157 responses



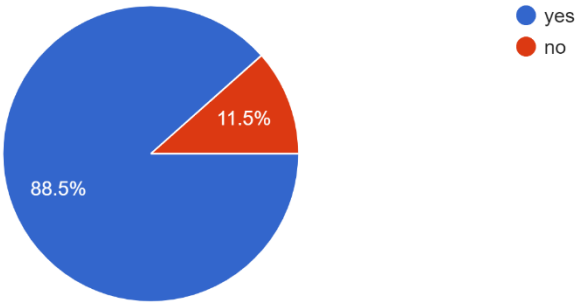
Q2. Are you of the opinion that Biology and Engineering domains have crosstalk?

155 responses



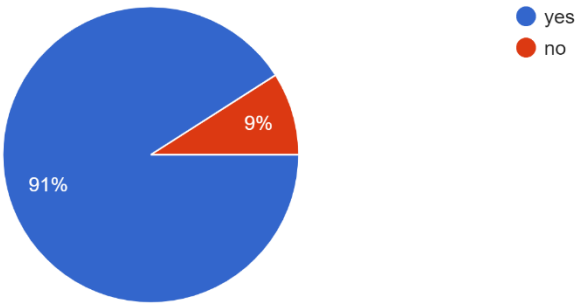
Q3. Have you realized that this course has re-framed your understanding about biological systems from engineering perspective

156 responses



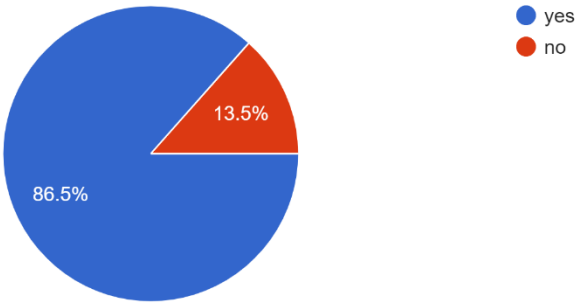
Q4. Does this course link basic biological information about to the engineering concept of molecules polymers?

155 responses



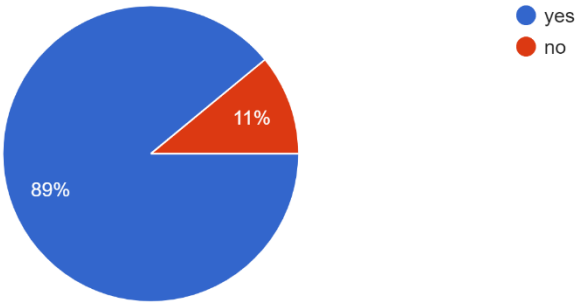
Q5. Does this course describe energy conservation optimised in biological systems through the process of photosynthesis and respiration?

156 responses



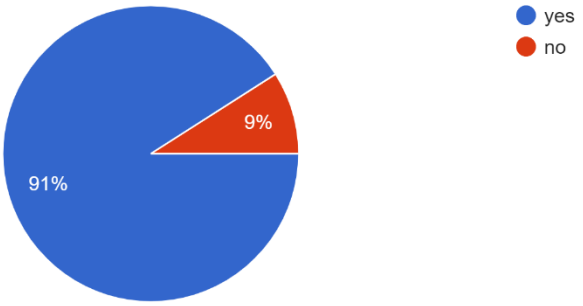
Q6. Can recent advancements and technologies like genetic engineering optimise plants, animals and microorganisms

155 responses



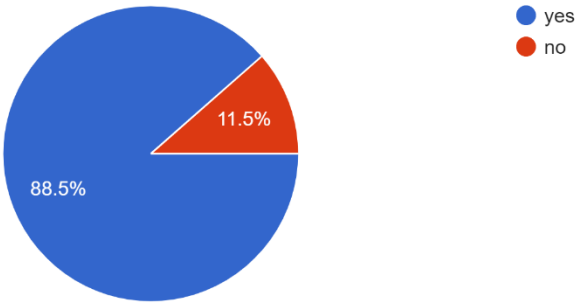
Q7. Do you think transport, communication and defense mechanisms of living systems inspires engineering research

155 responses



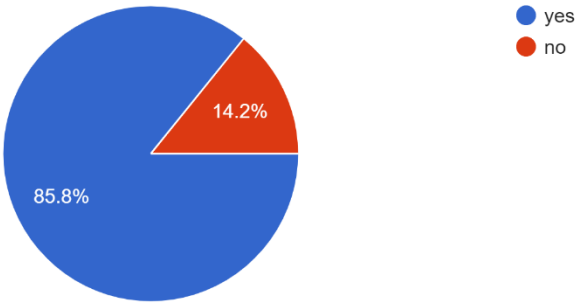
Q8. Could you appreciate that a part of this course offers discussion of biology related technologies in a branch specific manner

157 responses



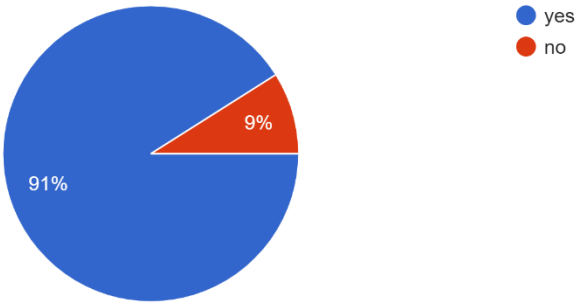
Q9. Did you find branch specific assignments of this course as opportunities for updating knowledge and enhancing teamwork?

155 responses



Q10. Did you think to certain extent, basic information about biology is necessary for every engineer?

156 responses



(Indirect) CO attainment for 2018-19

Sr No	Questions mapped to CO	% attained	Target	%attained * weightage for Indirect assessment
CO-1	1, 4	91.05	60	
CO-2	2, 5	83.9	60	
CO-3	3,7	89.75	60	
CO-4	8,9	87.15	60	
CO-5	6,10	90	60	

(Direct) CO attainment (2018-19)

CO Assessment with different evaluation modes

Course Outcome	Assessment	Marks	Weightage Total	Results
CO a	Test I, ESE	30	30	Y
CO b	ESE	10	10	Y
CO c	ESE	10	10	Y
CO d	ESE	10	10	Y
CO e	ESE, Test II	10	10	Y

Course outcome	KDK (Comp, IT, ENTC)	AAK (Mech I-II, Meta)	MRS (Prod, Instru)	MKR (Civil, Electrical)	Total (average)
CO-1	72.22%	87.75%	79.2%	80.33%	79.88%
CO-2	56.16%	69.75%	65.33%	71.66%	65.73%
CO-3	60.83%	69%	74.5%	69.57%	68.48%
CO-4	63.33%	75.75%	66.5%	62%	66.90%
CO-5	62.5%	64.33%	76%	67.22%	67.51%

Course Outcome Assessment

CO Assessment	Test 1	Test 2	ESE
CO-1	Q 1	-	Q1
CO-2	-	-	Q2
CO-3	-	-	Q3
CO-4	-	-	Q4

CO-5	-	Q 2	Q5

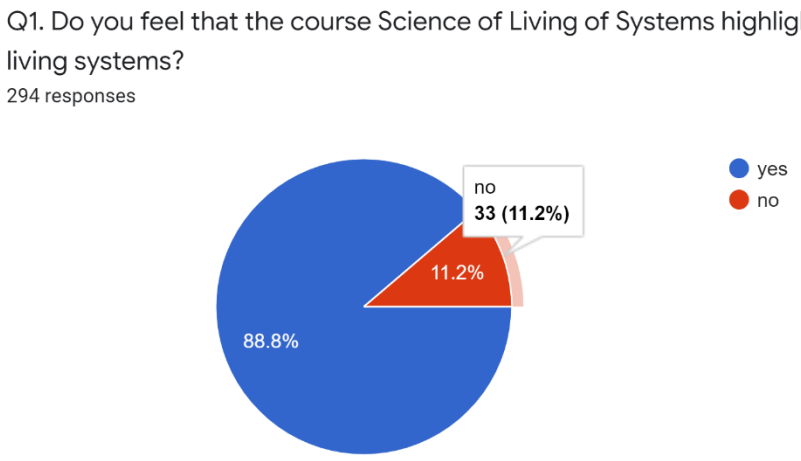
CO attainment (Direct and Indirect) 2018-19

CO attainment calculation with direct and indirect weightage

Co	T1+T2+ESE * 0.8	Exit survey responses* 0.2	Final CO attained	Target achievement 60%
CO-1	79.88 X 0.8	91.05 X 0.2	82.1	Attained
CO-2	65.73 X 0.8	83.9 X 0.2	69.28	Attained
CO-3	68.48 X 0.8	89.75 X 0.2	72.73	Attained
CO-4	66.90 X 0.8	87.15 X 0.2	70.43	Attained
CO-5	67.51 X 0.8	90 X 0.2	70.008	Attained

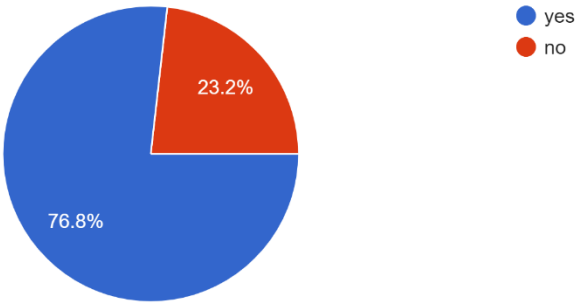
Exit Survey 2019-20:

294 responses



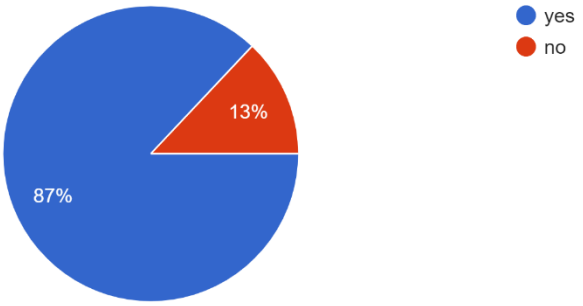
Q2. Are you of the opinion that Biology and Engineering domains have crosstalk?

293 responses



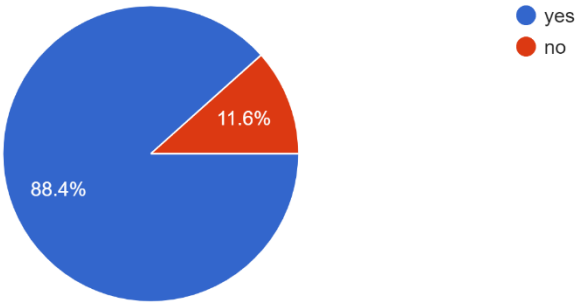
Q3. Have you realized that this course has re-framed your understanding about biological systems from engineering perspective

293 responses



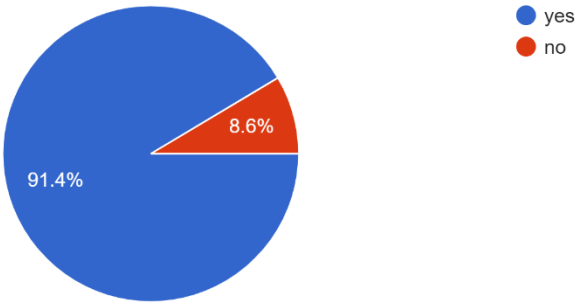
Q4. Does this course link basic biological information about to the engineering concept of molecules polymers?

293 responses



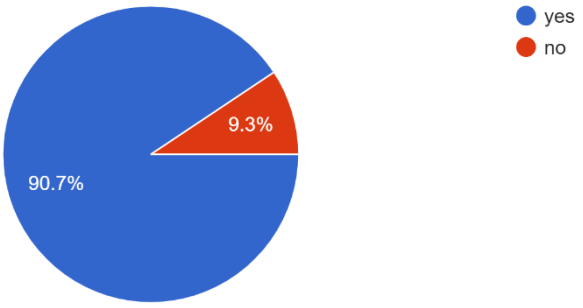
Q5. Does this course describe energy conservation optimised in biological systems through the process of photosynthesis and respiration?

292 responses



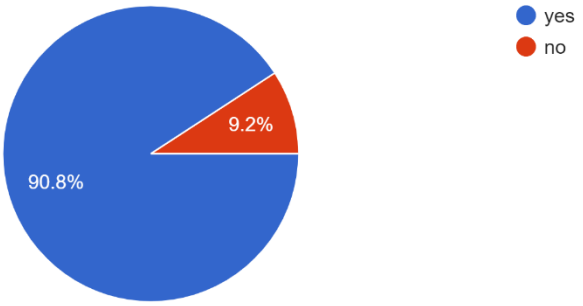
Q6. Can recent advancements and technologies like genetic engineering optimise plants, animals and microorganisms

289 responses



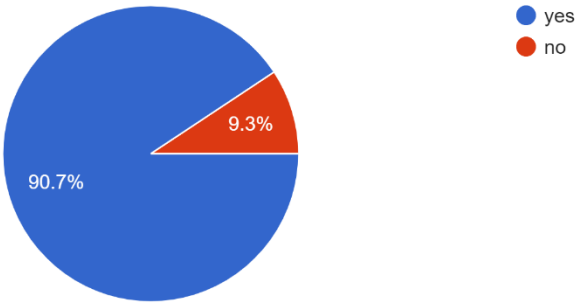
Q7. Do you think transport, communication and defense mechanisms of living systems inspires engineering research

294 responses



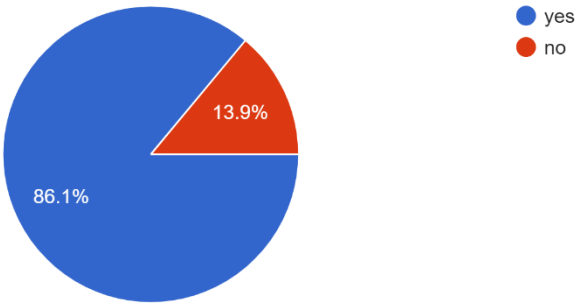
Q8. Could you appreciate that a part of this course offers discussion of biology related technologies in a branch specific manner

290 responses



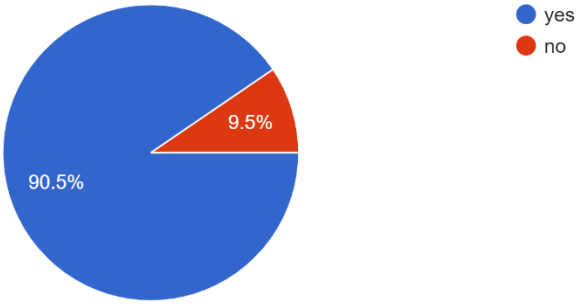
Q9. Did you find branch specific assignments of this course as opportunities for updating knowledge and enhancing teamwork?

294 responses



Q10. Did you think to certain extent, basic information about biology is necessary for every engineer?

294 responses



(Indirect) CO attainment for 2018-19

Sr No	Questions mapped to CO	% attained	Target	%attained * weightage for Indirect assessment
CO-1	1, 4	88.3	60	
CO-2	2, 5	84.1	60	
CO-3	3,7	88.9	60	
CO-4	8,9	88.4	60	
CO-5	6,10	90.6	60	

(Direct) CO attainment (2018-19)

Course Outcome	Assessment	Marks	Weightage Total	Results
CO-1	Test I, ESE	30	30	Y
CO-2	ESE	10	10	Y
CO-3	ESE	10	10	Y
CO-4	ESE	10	10	Y
CO-5	ESE, Test	10	10	Y

Course outcome	KDK (Comp I-II, ENTC, Meta)	MRS (Prod, Mech II Instru)	MKR (Civil, Electrical, Mech I)	Total (average)
CO-1	76.4%	73.2%	71.16%	73.58%
CO-2	69.8%	67.4%	66.33%	67.84%
CO-3	76.43%	69.07%	74.12%	73.2%
CO-4	66.14%	72.33%	70.21%	69.56%
CO-5	70.8%	66.33%	68%	68.37%

Course Outcome Assessment

CO Assessment	Test 1	Test 2	ESE
CO-1	Q 1	-	Q1
CO-2	-	-	Q2
CO-3	-	-	Q3
CO-4	-	-	Q4
CO-5	-	Q 2	Q5

CO attainment (Direct and Indirect) 2017-18

CO attainment calculation with direct and indirect weightage

Co	T1+T2+ESE * 0.8	Exit survey responses* 0.2	Final CO attained	Target achievement 60%
CO-1	73.58 X 0.8	88.3 X 0.2	72.1%	Attained
CO-2	67.84 X 0.8	84.1 X 0.2	71.09%	Attained
CO-3	73.2 X 0.8	88.9 X 0.2	76.34%	Attained
CO-4	69.56 X 0.8	88.4 X 0.2	67.83%	Attained
CO-5	68.37 X 0.8	90.6 X 0.2	72.82%	Attained